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THE
ASIATIC SOCIETY OF BOMBAY
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SUPPLEMENTAL VOLUMES

TO THE

WORKS

OF

SIR WILLIAM JONES.

CONTAINING THE WHOLE OF THE

ASIATICK RESEARCHES

HITHERTO PUBLISHED,

48414

EXCEPTING THOSE PAPERS ALREADY INSERTED IN HIS WORKS.

VOL. I.

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ADVERTISEMENT.

THE conſideration of Sir WILLIAM JONES, as a man of Genius, his uncommon proficience in general learning, and his unrivalled attainments in the learning of the Eaſt, having unitedly called for an Edition of his Works, theſe Volumes are added to make them complete.

The PUBLICK need not be told, that to him the ASIATICK SOCIETY owes its exiſtence; and, as it was conſtituted under his auſpices, ſo, to his ſuperintendance it is indebted for the celebrity it now enjoys, and the incalculable advantages it cannot fail to confer. Excluſively of the Papers which were delivered by the PRESIDENT in it, there is more than reaſon to ſuppoſe, many others were indebted to his pen; and as the greateſt part of theſe papers were produced whilſt he continued to preſide, they in a ſpecial manner are appropriate to him. At leaſt, thus far they certainly are, as aſcertaining the extent which he witneſſed of his own inſtitution, and what it drew from his influence and perſonal exertions, in conjunction with the Members who placed him at their head.

Under this impreſſion, the Purchaſers of the Works of this ineſtimable Man, will conſider the ſubſequent Volumes as a neceſſary Addition.

CONTENTS.

PAGE

A DISSERTATION on the Orthography of Aſiatick Words in Roman Letters - - - - - - - - - 7
Aſtronomical Obſervations in Fort William, and between Madras and Calcutta ib.
A Royal Grant of Land, engraved on a Copper Plate, bearing date Twenty-three Years before Chriſt; and diſcovered among the Ruins at Mongueer 62
An Inſcription on a Pillar near Buddal - - - - - - - 67
Remarks on the two preceding Papers - - - - - - - 73
Some Account of the Sculptures and Ruins at Mavalipurum, a Place a few Miles north of Sadras, and known to Seamen by the Name of the Seven Pagodas - - - - - - - - - - - 75
Hints relative to Friction in Mechanicks - - - - - - - 92
Copy of an Account given by Mr. Turner, of his Interview with Teeſhoo Lama at the Monaſtery of Terpaling, encloſed in Mr. Turner's Letter to the Honourable the Governor-general, dated Patna, 2d March, 1784 111
An Account of a Journey to Tibet - - - - - - - 116
On the Gods of Greece, Italy, and India - - - - - - 125
A Deſcription of a Cave near Gyá - - - - - - - - ib.
A Letter from Charles Wilkins, Eſq. to the Secretary - - - 127
A Tranſlation of a Sanſcrit Inſcription - - - - - - 129
Tranſlation of a Sanſcrit Inſcription, copied from a Stone at Bŏŏd-dhă-Gāyā, by Mr. Wilmot, 1785 - - - - - - - - - 130
Obſervations on the Seeks and their College - - - - - 133
An Extract of a Letter from Francis Fowke, Eſq. to the Preſident - 137
A Deſcription of the Máhwah Tree - - - - - - - 140
Of the Method of Diſtilling, as practiſed by the Natives at Chatra in Ramgur, and in the other Provinces, perhaps, with but little Variation - 146
A Method of Calculating the Moon's Parallaxes, in Latitude and Longitude 153
Remarks on the Artificial Horizons, &c. - - - - - - 158
Demonſtration of a Theorem concerning the Interſections of Curves - 160
The Proceſs of making Attar, or Eſſential Oil of Roſes - - - 161
Remarks on the Gold of Limong - - - - - - - 163
On the Literature of the Hindus, from the Sanſcrit - - - - 165

An

CONTENTS.

PAGE

An Indian Grant of Land in Y. C. 1018, literally tranſlated from the Sanſcrit, as explained by Rámalóchan Pandit, communicated by General Carnac 166
Remarks on the City of Tagara - - - - - - 167
On the Pangolin of Bahar - - - - - - - 171
Inſcriptions on the Staff of Fírúz Shah. Tranſlated from the Sanſcrit, as explained by Rádhácánta Sarman - - - - - ib.
A Converſation with Abram, an Abyſſinian, concerning the City of Gweñder and the Sources of the Nile - - - - - - ib.
On the Courſe of the Nile - - - - - - - ib.
On the Trial by Ordeal, among the Hindus.—By Alí Ibráhím Khán, Chief Magiſtrate at Banáres - - - - - - - 172
The Indian Law of Ordeal, verbally tranſlated from Yágyawalcya - 180
The Second Anniverſary Diſcourſe, delivered 24th February, 1785 - 208
The Third Anniverſary Diſcourſe, delivered 2d February, 1786 - - ib.
Corrections of the Lunar Method of finding the Longitude - - 209
A Meteorological Journal - - - - - - - 211
The Fourth Anniverſary Diſcourſe, delivered 15th February, 1787 - 221
The Fifth Anniverſary Diſcourſe, delivered 21ſt February, 1788 - ib.
The Sixth Anniverſary Diſcourſe, delivered 19th February, 1789 - ib.
A Letter from the late Henry Vanſittart, Eſq. to the Preſident - - ib.
On the Deſcent of the Afghans from the Jews - - - - - 223
Note to Mr. Vanſittart's Paper on the Afghans being deſcended from the Jews - - - - - - - - - 227
Remarks on the Iſland of Hinzuan, or Johanna - - - - 228
On the Baya, or Indian Groſs-Beak - - - - - ib.
On the Chronology of the Hindus - - - - - ib.
On the Cure of the Elephantiaſis - - - - - ib.
On the Cure of the Elephantiaſis, and other Diſorders of the Blood - ib.
On the Indian Game of Cheſs - - - - - ib.
Two Inſcriptions from the Vindhya Mountains, tranſlated from the Sanſcrit by Charles Wilkins, Eſq. - - - - - - 229
A Deſcription of Asàm by Mohammed Cazim, tranſlated from the Perſian by Henry Vanſittart, Eſq. - - - - - - 231
On the Manners, Religion, and Laws, of the Cúcì's, or Mountaineers of Tipra - - - - - - - - - 240

On

CONTENTS.

PAGE

On the Second Claſſical Book of the Chineſe - - - - 245
A Letter to the Preſident from a young Chineſe - - - ib.
A Table, containing Examples of all the different Species of Infinitives and Participles that are derived from Triliteral Verbs, in the Form in which they are uſed in the Perſian and in the Language of Hindoſtan - 247
On the Introduction of Arabick into Perſian - - - - 251
On the Aſtronomical Computations of the Hindus - - - 264
On the Antiquity of the Indian Zodiack - - - - - 306
An Account of the Kingdom of Népál, by Father Giuſeppe, Prefect of the Roman Miſſion - - - - - - - - ib.
On the Cure of Perſons bitten by Snakes - - - - 317
On ſome Roman Coins found at Nelore - - - - 321
Extract of a Letter from A. Davidſon, Eſq. dated Madras, July 12, 1787 322
On Two Hindu Feſtivals, and the Indian Sphinx - - - ib.
A ſhort Deſcription of Carnicobar, by Mr. G. Hamilton - - - 324
The Deſign of a Treatiſe on the Plants of India - - - 330
On the Diſſection of the Pangolin - - - - - ib.
A Letter from Doctor Anderſon, to Sir William Jones - - - 334
On the Lácſhà, or Lac Inſect - - - - - - ib.
The Seventh Anniverſary Diſcourſe, on the Chineſe - - - 336
The Tranſlation of an Inſcription in the Maga Language, engraved on a Silver Plate found in a Cave near Iſlamabád - - - - 337
A Supplement to the Eſſay on Indian Chronology - - - 340
On the Spikenard of the Ancients - - - - - ib.
A Meteorological Diary - - - - - - 341
Abſtract of a Meteorological Regiſter, kept at Calcutta, 1784 and 1785 366
A Synopſis of the different Caſes that may happen in deducing the Longitude of one Place from another by Means of Arnold's Chronometers, and of finding the Rates when the Difference of Longitude is given - 367
Memorandums concerning an Old Building, in the Hadjipore Diſtrict, near the Gunduck River, &c. - - - - - - 369
Obſervations of ſome of the Eclipſes of Jupiter's Satellites - - 372
A Proof that the Hindoos had the Binomial Theorem - - - 375
The Eighth Anniverſary Diſcourſe - - - - - 383
Obſervations on the Inhabitants of the Garrow Hills - - - ib.

A Royal

CONTENTS.

	PAGE
A Royal Grant of Land in Carnata - - - - -	398
On the Muſical Modes of the Hindus - - - - -	408
A Letter from Lieutenant Browne to the Preſident - - -	ib.
An Account of the Battle of Paniput - - - - -	410
A Specimen of a Method of reducing Practical Tables and Calculations into more general and compendious Forms - - - -	444
A Demonſtration of one of the Hindu Rules of Arithmetick - -	447
On the Nicobar Iſles, and the Fruit of the Mellori - - -	449
On the Myſtical Poetry of the Perſians and Hindus - - - -	460
Gítagóvinda; or, the Songs of Jayadéva - - - - -	ib.
On the Indian Cycle of Sixty Years - - - - -	461
An Account of the Method of catching wild Elephants at Tipura -	474
The Plan of a Commonplace-Book - - - - -	488
The Lunar Year of the Hindus - - - - -	493

THE

INTRODUCTION.

IF this firſt Publication of the ASIATICK SOCIETY *ſhould not anſwer thoſe expectations which may have been haſtily formed by the learned in* Europe, *they will be candid enough to conſider the diſadvantages which muſt naturally have attended its inſtitution, and retarded its progreſs. A mere man of letters, retired from the world, and allotting his whole time to philoſophical or literary purſuits, is a character unknown among* Europeans *reſident in* India, *where every individual is a man of buſineſs in the civil or military ſtate, and conſtantly occupied either in the affairs of government, in the adminiſtration of juſtice, in ſome department of revenue or commerce, or in one of the liberal profeſſions. Very few hours, therefore, in the day or night, can be reſerved for any ſtudy, that has no immediate connection with buſineſs, even by thoſe who are moſt habituated to mental application: and it is impoſſible to preſerve health in* Bengal *without regular exerciſe and ſeaſonable relaxation of mind; not to inſiſt that, in the opinion of an illuſtrious* Roman, *"No one can be ſaid "to enjoy liberty, who has not ſometimes the privilege of doing nothing." All employments, however, in all countries, afford ſome intervals of leiſure; and there is an active ſpirit in* European *minds, which no climate, or ſituation in life, can wholly repreſs, which juſtifies the ancient notion, that* a change of toil is a ſpecies of repoſe; *and which ſeems to conſider nothing done or learned, while any thing remains unperformed or unknown. Several* Engliſhmen, *therefore, who reſided in a country, every part of which abounds in objects of curious and uſeful ſpeculation, concurred in opinion, that a Society inſtituted at* Calcutta, *on the plan of thoſe eſtabliſhed in the principal cities of* Europe, *might poſſibly be the means of concentrating all the valuable*

knowledge

knowledge which might occaſionally be attained in Aſia ; *or of preſerving at leaſt many little tracts and eſſays, the writers of which might not think them of ſufficient importance for ſeparate publication. The* ASIATICK SOCIETY *was accordingly formed on the 15th of* January, 1784, *by thoſe Gentlemen whoſe names are diſtinguiſhed by aſteriſks in the Liſt of Members at the end of this Book ; and ample materials have already been collected for two large volumes on a variety of new and intereſting ſubjects. By this Publication the Inſtitution may be conſidered as having taken root : but the plant will flouriſh or fade, according as the activity or remiſſneſs of the Members and their correſpondents ſhall promote or obſtruct its growth. It will flouriſh, if naturaliſts, chymiſts, antiquaries, philologers, and men of ſcience, in different parts of* Aſia, *will commit their obſervations to writing, and ſend them to the Preſident or the Secretary at* Calcutta ; *it will languiſh, if ſuch communications ſhall be long intermitted ; and it will die away, if they ſhall entirely ceaſe : for it is morally impoſſible that a few men, whatever be their zeal, who have great publick duties to diſcharge, and difficult private ſtudies connected with thoſe duties, can ſupport ſuch an eſtabliſhment without the moſt aſſiduous and eager auxiliaries.*

Before we proceed to give a ſhort hiſtory of the inſtitution, it may be proper to declare, that the Society will paſs no deciſion, in their collective *capacity, on any point of literature or philoſophy ; but that the writers of ſuch diſſertations, as they ſhall think worthy to be publiſhed from time to time, muſt hold themſelves individually reſponſible for their own opinions ; a declaration which is conformable, we believe, to the practice of ſimilar Societies in* Europe.

It having been reſolved to follow, as nearly as poſſible, the plan of the Royal Society *at* London, *of which the* King *is* Patron, *it was agreed, at the firſt regular meeting, that the Letter here exhibited ſhould be ſent to the Governor General and Council, as the* Executive Power *in the Company's territories : and their anſwer, which is alſo ſubjoined, was received in the courſe of the next month.*

TO

TO THE

HONOURABLE WARREN HASTINGS, ESQUIRE,

Governor General, Preſident;

EDWARD WHELER, JOHN MACPHERSON,

AND JOHN STABLES, ESQUIRES,

Members of the Council of FORT WILLIAM *in* BENGAL.

HONOURABLE SIR AND GENTLEMEN,

A SOCIETY, of which we are members, having been inſtituted for the purpoſe of enquiring into the Hiſtory, civil and natural, the Antiquities, Arts, Sciences, and Literature of *Aſia*, we are deſirous that you will honour us with accepting the title of our *Patrons*, and requeſt you to conſider this application as a token of the great reſpect with which we are,

Honourable Sir and Gentlemen,

Your moſt obedient,

And moſt humble ſervants,

JOHN HYDE,
WILLIAM JONES,
JOHN CARNAC,
DAVID ANDERSON,
WILLIAM CHAMBERS,
FRANCIS GLADWIN,
JONATHAN DUNCAN,
THOMAS LAW,
CHARLES WILKINS,
JOHN DAVID PATERSON,
CHARLES CHAPMAN,
CHARLES HAMILTON,
GEORGE HILARO BARLOW.

Calcutta, Jan. 22, 1784.

THE ANSWER.

GENTLEMEN,

WE very much approve and applaud your endeavours to promote the extenſion of knowledge by the means which your local advantages afford you in a degree, perhaps, exceeding thoſe of any part of the *globe*; and we derive great hopes of your attainment of ſo important an end, from our perſonal knowledge of the abilities and talents of the Gentlemen whoſe names we read in the ſubſcription to your addreſs.

We accept the title you have been deſirous of conferring upon us of *Patrons* to your Society, and ſhall be happy to avail ourſelves of any occaſion that may occur of contributing to its ſucceſs.

We are, Gentlemen,

Your moſt obedient humble ſervants,

WARREN HASTINGS,
EDWARD WHELER,
JOHN MACPHERSON,
JOHN STABLES.

MR. HASTINGS *therefore appeared, as Governor General, among the Patrons of the new Society; but he ſeemed, in his private ſtation, as the firſt liberal promoter of uſeful knowledge in* Bengal, *and, eſpecially as the great encourager*

courager of Perſian *and* Sanſcrit *literature, to deſerve a particular mark of diſtinction; and he was accordingly requeſted, in a ſhort letter, to accept the title of* Preſident. *It was, indeed, much doubted whether he would accept any office, the duties of which he could not have leiſure to fulfil; but an offer of the honorary title was intended as a tribute of reſpect, which the occaſion ſeemed to demand, and which could not have been omitted without an appearance of inattention to his diſtinguiſhed merit. His anſwer is alſo annexed.*

GENTLEMEN,

I AM highly ſenſible of the honour which you have been pleaſed to confer upon me, in nominating me to be the Preſident of your Society; and I hope you will both admit and approve the motives which impel me to decline it.

From an early conviction of the utility of the inſtitution, it was my anxious wiſh that I might be, by whatever means, inſtrumental in promoting the ſucceſs of it; but not in the mode which you have propoſed, which, I fear, would rather prove, if of any effect, an incumbrance on it.

I have not the leiſure requiſite to diſcharge the functions of ſuch a ſtation: nor, if I did poſſeſs it, would it be conſiſtent with the pride which every man may be allowed to avow in the purſuit or ſupport of the objects of his perſonal credit, to accept the firſt ſtation in a department, in which the ſuperior talents of my immediate followers in it would ſhine with a luſtre, from which mine muſt ſuffer much in the compariſon; and to ſtand in ſo conſpicuous a point of view the only ineffective member of a body which is yet in its infancy, and compoſed of members with whoſe abilities I am, and have long been, in the habits of intimate communication, and know them to be all eminently qualified to fill their reſpective parts in it.

On

On theſe grounds I requeſt your permiſſion to decline the offer which you have done me the honour to make to me, and to yield my pretenſions to the Gentleman whoſe genius planned the inſtitution, and is moſt capable of conducting it to the attainment of the great and ſplendid purpoſes of its formation.

I, at the ſame time, earneſtly ſolicit your acceptance of ſervices in any way in which they can be, and I hope that they may be, rendered uſeful to your reſearches.

I have the honour to be, Gentlemen,

Your moſt obedient,

And moſt humble ſervant,

WARREN HASTINGS.

Fort William,
Jan. 30, 1784.

On the receipt of this letter, SIR WILLIAM JONES *was nominated Preſident of the Society; and, at their next meeting, he delivered the following Diſcourſe:*

A DISCOURSE ON THE INSTITUTION OF A SOCIETY FOR INQUIRING INTO THE HISTORY, CIVIL AND NATURAL, THE ANTIQUITIES, ARTS, SCIENCES, AND LITERATURE OF ASIA.

See the Works of Sir William Jones, Vol. I. p. 1.

I.

A DISSERTATION ON THE ORTHOGRAPHY OF ASIATICK WORDS IN ROMAN LETTERS.

See the Works of Sir William Jones, Vol. I. p. 175.

II.

ASTRONOMICAL OBSERVATIONS IN FORT WILLIAM, AND BETWEEN MADRAS AND CALCUTTA;

By *COLONEL THOMAS D. PEARSE,*

Commandant of the Artillery, and Second in Command of the Bengal Army.

I BEG leave to communicate to the Society ſome aſtronomical obſervations which I made at different times in *Fort William.*

The clock I uſed from December, 1775, was made by Ellicot: it beats dead ſeconds: there is one hand for minutes, and the hours revolve with the plate fixed to the hour wheel.

The pendulum can be lengthened, without ſtopping the clock, by means of a ſcrew, which ſupports the ſpring by which the pendulum hangs. And the pendulum is deſcribed in the 47th volume of the Philoſophical Tranſactions, p. 479. The clock-caſe is firmly ſcrewed to the wall. The tranſit inſtrument was made by SISSON; it is four feet long, and has a double object glaſs. This is ſupported by two iron bars, which are joined to a ſquare frame, that lies two feet under the floor, buried in brick work.

The upright bars are protected by a caſe of wood, which is fixed to the houſe, without touching them in any part.

At firſt I uſed the cornice of the Commandant's houſe to adjuſt by; but afterwards a ſlider, with a ſlit in it, was put up in the area of the fort, near the ſame place, behind which I could place a light to adjuſt with by night. There was another object alſo to the ſouth, about 1500 yards off, which I could uſe by day; and both theſe were fixed when the tranſits by teleſcope, and equal altitudes agreed, and were examined from time to time.

I had

I had only a tolerably good HADLEY's quadrant and quickſilver, till December, 1776, when I was lucky enough to get an 18 inch land quadrant, made by RAMSDEN, with a micrometer, to ſubdivide the nonius. This inverts, and is capable of the niceſt adjuſtments. My firſt teleſcope was an 18 inch reflector, made by GREGORY.

In Auguſt, 1777, I obtained Mr. SMITH's refractor, made by DOLLAND, with a triple object glaſs, and a double object glaſs micrometer. And I made a polar axis for it of braſs with rack work, and a declination circle not divided, which alſo is racked; to which, when the micrometer was uſed, the teleſcope was fixed.

I likewiſe communicate obſervations made by myſelf chiefly, and by Lieutenant COLEBROKE for me, to aſcertain the longitudes and latitudes of places between *Madras* and *Calcutta*.

Going to *Madras* in 1782, I uſed an HADLEY's octant and quickſilver, which I ſhall here deſcribe.

The octant had a wooden index. I ſeparated the part which carries the ſpeculum from the arm; then fixed it into a lathe, and turned it on its own centre: it was three-tenths of an inch thick; the thickneſs was divided into three parts, and then the edge was turned away on each ſide; ſo that the whole piece of wood became like three wheels of different diameters joined together on their flat ſurfaces, and the middle one was the biggeſt; that below was the next in ſize; and the upper one was the leaſt, and only equal to the braſs plate on which the ſpeculum was ſcrewed.

A plate of braſs, nearly one-tenth thick, broad enough to admit of a hole as big as the under circular part of the turned wood, and to afford a rim of half an inch broad, was then fixed into the lath, and had a hole turned in it of that ſize: on one ſide it had an arm as broad as the wooden index was.

A ſecond plate of the ſame kind was alſo prepared; but the hole was larger, though leſs than the middle part of the turned wood.

The turned piece was then fixed to the octant by its pin, and the plate with the ſmaller hole beneath it. As they fitted very nicely, the braſs plate turned upon the wood round the centre of the octant, if that were held faſt; and both turned on the centre pin if they were preſſed together.

The plate with the large hole was then laid above the turned wood, its centre coinciding with the common centre: the wooden arm of the index had the end neareſt the centre cut away, above and below, equal to the thickneſs of the plates

of

of braſs: it was there fixed to the octant in the ſame manner as before it was cut off from the centre, and the braſs plates were drilled and rivetted to it.

When theſe plates were preſſed together, they held the turned piece as it were in a vice; when they were forced aſunder, the turned piece might be moved independently; and there were in the direction of the radius two ſcrews, one beyond the ſpeculum, and one between it and the nonius, for the purpoſe: they had button heads, and their ſhanks were as high as the top of the index ſpeculum.

On the back of the octant there was a ſcrew with a button head; the thread entered the centre pin, and the ſhoulder preſſed upon the plate which keeps that pin in its place.

The back ſcrew and vice ſcrews being ſlacked, the index ſpeculum was brought parallel to the horizon glaſs; then the vice ſcrews were turned to join the ſpeculum to the index, as before the alteration was made.

To extend the power of the octant occaſionally, it was nicely adjuſted: then the index was carried to 90°, and there ſcrewed to the limb. Next the back ſcrew of the centre pin was forced, till by its preſſure the ſpeculum piece was held faſt: after that, the vice ſcrews being ſlacked, the index was carried back to 0°, and there ſcrewed to the limb. Whilſt it was in this poſition, the vice ſcrews were again turned, which fixed the ſpeculum piece to the index, and then the back ſcrew being ſlacked, the ſpeculum followed its motions. When it was uſed, the index ſhewed the angle which was to be added to 90° for the angular diſtance.

By this contrivance, with an octant, I could take angles of 150°; and conſequently meridian altitudes as far as 75°: and if the horizon glaſs and teleſcope could have been made to ſlide nearer towards the centre, it would have been increaſed ſtill further.

In RAMSDEN'S new quadrant there is a ſcrew to adjuſt the horizon glaſs, and bring it parallel to the other: provided the index ſpeculum is perpendicular to the limb, this is all well; but if that be inclined, as ſoon as the index quits 0°, there will be an error in the angles obſerved. I found it ſo experimentally, and corrected my quadrants accordingly, by turning the horizon glaſs round its own axis; then, having adjuſted as uſual, the error ſide-ways was corrected by moving both glaſſes, by means of their adjuſting ſcrews, and dividing the error between them. If, when the horizon glaſs was reſtored to its proper poſition, there ſtill was a lateral error, the operation was repeated. I do not find any mention of this in any of the inſtructions for uſing HADLEY'S inſtruments that I have ſeen.

The horizon was artificial, invented for the occaſion, and conſiſted of a wooden

trough about half inch deep (or rather more), filled nearly with quickſilver, which ſerved to float a plate of thick glaſs, the under ſurface of which had been unpoliſhed and blacked, that only one image might appear. This needs not any adjuſtment: the only requiſite is, that the glaſs be equally thick all over, and ſmooth: that which was uſed was a part of a very large looking glaſs, that had been broken by accident.

The watch was a time-keeper, by BROOKBANK, which goes whilſt it is wound up, and is tolerably good, conſidered as a ſale watch ſent to *India*.

The teleſcope had a double object glaſs, with a braſs ſtand, and was made by GREGORY: it magnifies 80 times, but, like all of this conſtruction, that I have ſeen, it had a dark ſpeck in the middle, and was not equally good in the whole field.

In the way back, we had a land quadrant, of 15 inches radius, made by B. MARTIN, and ſent out by the *India* Company. It was uſed by Mr. HURST in the tranſit of *Venus*. This could not be inverted. But, to deſtroy the effects of collimation, and error of level, the latitudes are all determined by ſtars taken north and ſouth of each place, as the obſervations will ſhew.

JUPITER's FIRST SATELLITE.

IMMERSIONS.

Date.	*Apparent time Correct.* H. M. S.	*Time by Ephemeris.* H. M. S.	*Longitude.* H. M. S.	
1774, 14th Oct.	12.32.25	6.39.00	5.53.25	*Jupiter* very nearly vertical, and
23d do.	8.57.15	3.03.17	5.53.58	the glaſs ſhook much.
1776, 13th Nov.	13.58.56,3	8.04.46	5.54.10,3	
29th	12.09.39	6.15.53	5.53.46	
6th Dec.	14.00.32,6	8.06.38	5.53.54,6	
13th.	15.50.59,3	9.57.02	5.53.57,3	
15th.	10.18.31	4.24.35	5.53.56	
22d.	12.08.47,6	6.14.50	5.53.57,6	
31ſt.	8.26.54,1	2.32.49	5.54.05,1	
1777, 16th Jan.	8.51.19,6	2.57.11	5.54.08,6	
27th Dec.	9.38.58,8	3.45.01	5.53.57,8	*Dollond*'s triple object glaſs.

EMERSIONS.

1774, 29th Dec.	11.25.47	5.31.52	5.53.45	
1777, 30th Jan.	12.36.11,8	6.42.30	5.53.41,8	
1778, 15th March.	8.40.49,6	2.47.41	5.53.08,6	*Dollond*'s triple object glaſs.
7th April.	9.00.02,2	3.07.00	5.53.02,2	Ditto.
14th.	10.56.35,1	5.03.30	5.53.05,1	Ditto.
1779, 3d May.	12.07.38,8	6.14.37	5.53.01,8	Ditto.

SECOND

SECOND SATELLITE.

IMMERSIONS.

Date.	*Apparent time Correct.* H. M. S.	*Time by Ephemeris.* H. M. S.	*Longitude.* H. M. S.	
1776, 4th Dec.	10.53.23,5	4.58.08	5.55.21,5	
11th.	13.25.50,4	7.30.42	5.55.08,4	
18th.	15.58.21	10.03.14	5.55.07,0	
29th.	7.48.01,4	1.52.27	5.55.34,4	
1780, 11th July.	9.34.17,3	3.41.33		Emerged from behind the body 9.27.04,3, and was quite clear of the body at 9.28.55,3. *Dollond*'s triple object glaſs.

EMERSIONS.

1775, 29th Dec.	8.47.41,7	2.53.18	5.54.23,7	
1777, 23d Jan.	7.32.44,3	1.37.41	5.55.03,3	
29th April.	7.20.34,1	1.25.43	5.54.51,1	
6th May.	9.59.28,9	4.04.11	5.55.17,9	
1779, 8th May.	11,45,53,5	5.52.13	5.53.40,5	Here the tables ſeem to have been corrected. *Dollond*'s triple object glaſs.

THIRD SATELLITE.

1774, 10th Nov.	13.12.30	7.18.17	Emerſion.	
1775, 28th Jan.	7.28.58,5	1.33.45	Immerſion.	
	9.04.20	3.07.49	Emerſion.	But I thought I ſaw it about a minute before; however, it was ſo very dim that I cannot be certain.
1776, 3d Nov.	10.55.20,2	5.00.14	Emerſion.	
17th.	15.31.51,3	9.42.37	Immerſion.	
23d Dec.	11.10.33,6	5.19.58	Immerſion.	
1777, 28th Jan.	10.13.13,2	4.22,53	Emerſion.	
1778, 3d April.	9.21.24,9	3.33.12	Do.	I think I might have ſeen it earlier if I had expected it to emerge at a greater diſtance than one Satellite appeared, which was the caſe. *Dollond*'s triple object glaſs.
1779, 2d May.	8.44.37,5	2.54.27	Immerſion.	Rather doubtful.
	45.26,5			I thought I ſaw it, but *Jupiter* was ſo very bright it dazzled my eyes.
	11.32.80,6	5.44.27	Emerſion.	

FOURTH SATELLITE.

1776, 2d Nov.	13.23.14,0		Emerſion.	
1777, 8th Jan.	9.28.49,5		Immerſion.	
25th.	7.23.02,0		Emerſion.	At the time of this obſervation, there was a very ſmall ſtar a very little to the weſt of the weſtern Satellite.
1778, 9th May.	8.25.13,0		Emerſion.	*Dollond*'s triple object glaſs.

Other Obſervations of Jupiter *and his Satellites.*

1776, 22d November, between 9 and 10, I ſaw a very ſmall ſtar, not bigger than a Satellite, very near to *Jupiter*. The configuration thus,

At $12^h.9'.39''$ the configuration was thus,

that is, the two outermoſt Satellites had gone forward, and *Jupiter* back, in right aſcenſion, viſibly.

30th November, the configuration was thus,

that is, the ſtar was north; diſtant from the limb in declination about the quantity of the leſſer axis. In right aſcenſion the ſtar was advanced further than *Jupiter*'s centre, about a fifth of the axis. Some time after I found that the little Satellite, which was below the limb, had immerged into the diſk; and ſoon after I ſaw the ſhadow of that Satellite upon the Great Belt. I obſerved the ſhadow go off the diſk; and about an hour after that, the Satellite emerged a little to the north of the Great Belt. The times were noted, but the book was deſtroyed by accident. When *Jupiter* paſſed the meridian, I could not ſee the ſtar in the tranſit teleſcope; but about 4′ afterwards the configuration was thus,

that is, a line drawn from the ſtar to *Jupiter*'s centre, made an angle with the Great Belt, which I judged to be about 41°; and in that direction it was about the quantity of the leſſer axis diſtant from the limb; ſo that *Jupiter* had moved back about $\frac{3}{4}$ of his diameter from the time I firſt ſaw him to-night till he paſſed the meridian.

1776, 8th December, my clock was ſtopped by an earthquake, which ſpoilt the obſervation of the immerſion of *Jupiter*'s firſt Satellite.

1776,

1776, 23d *December, an Emerſion of the firſt Satellite from the Diſk.*

	Apparent Time correct. h , "
The ſhadow touched the middle of the edge of the Great Belt, and made a viſible notch in it	11.26.00
It was ſtill viſible	28.05
It vaniſhed	30.50
Satellite at the edge of the limb	53.25
In contact emerged	58.53

1777, 25th January, $7^h.23'.00''$,6, I ſaw a ſmall ſtar a little to the weſt of the weſtermoſt Satellite, not ſo bright as either of them; it was hardly viſible through the reflector.

Configuration thus,

26th, I could not find the ſtar at $7^h.11'$.

29th May, *Jupiter*'s ſecond Satellite immerged behind the diſk - $7^h.25'.18''$,7

1779, 2d *May, an Immerſion of* Jupiter*'s firſt Satellite into the Diſk.*

	Apparent Time correct. h , "
In contact	11.31.37,6
Immerſion doubtful	35.19,6
certain	35.50,6

If the immerſions and emerſions of this nature were calculated ſo as to ſet aſtronomers to look out for them, *Jupiter*'s Satellites might be rendered more uſeful than they now are in regard to longitudes by land; and that too, whether the calculations are accurate or erroneous.

For I mean to uſe an immerſion or emerſion of any kind, only to note an inſtant for taking the altitude of *Jupiter* at the place of obſervation.

If the inſtruments be of equal powers, and the eyes of equal ſtrength, then certainly the altitudes will be taken by every perſon, who ſhall obſerve the ſame phenomenon at one and the ſame inſtant of time; and thence the diſtance of *Jupiter* from

from the meridian of each will be known to ſeconds, if we ſuppoſe the latitudes known beforehand.

And if the teleſcopes of quadrants could be made ſufficiently powerful to obſerve the Satellites, then a ſingle obſerver, at any place, could perform the whole without trouble or difficulty, and would only need a common watch, and a little more patience than would be requiſite if the watch were perfect, and calculation true.

But ſuppoſing the teleſcopes and quadrants as they are, and two obſervers at each place, one employed with the Satellite, and the other with the quadrant, then the latter muſt carefully keep the body of *Jupiter* on the line of altitude till the other tells him to ſtop, which is to be done at the inſtant of obſerving the expected phenomenon.

By this mode a degree of longitude may be meaſured with as much accuracy as a degree of latitude; and it is what I have in contemplation to perform, as ſoon as I can get the requiſite inſtruments.

Remarks on ſome erroneous Obſervations of Jupiter's *firſt Satellite.*

In 1778 I took notice, that when *Jupiter* is very near the oppoſition, the obſervations are not to be depended on, and that the Satellite vaniſhed without changing colour. The ſame happened in 1779, 1780, and again in 1784, at *Beemulwiſa*; therefore I have put down the times of ſuch obſervations, as they are reduced to apparent time, from the known deviation of the clock from mean time. The tranſit inſtrument was examined by ſtars that paſs over the zenith, and by others north and ſouth, and by equal altitudes; all which ſhewed it was as nicely in the meridian as it well could be.

In 1779, on the 3d of March, I obſerved η and μ Geminorum, and the deviation was the ſame as that derived from the tranſits of the ſun on the 23d February, and 5th March. In the obſervation of the moon 23d November following, the accuracy of its poſition was aſcertained, ſo that the times were correct; and the errors depend on ſomething at the ſatellite and planet. Perhaps *Jupiter*'s atmoſphere may be ſo denſe as to prevent the free paſſage of the diminiſhed light ſoon after the beginning of an eclipſe, or even before it. If ſo, theſe obſervations may tend to clear up that point, and to meaſure the extent of that atmoſphere.

Date.

Date.	*Apparent time Correct.* H. M. S.	*Ephemeris.* H. M. S	
1778, 4th Feb.	7.51.10,3	1.58.08	
1779, 23d do.	9.02.51,0	3.10.01	
2d March.	10.58.15	5.05.17	
9th do.	12.53.08	7.01.07	These two were observed at *Dumdum*, but the time was taken from the transit instrument by a watch, carried out before and back after, and compared with the clock.
11th do.	7.20.35,3	1.30.10	
1780, 13th March.	10.10.47,7	4.20.23	

All these observations were made with *Dollond*'s triple object glass.

Observations of Venus.

1776, 2d January, at $7^h.55'$, in the morning, I measured the distance between *Venus* and the *Sun* $46°.32'$.

I was informed the natives were viewing it with astonishment, but I did not see it with the naked eye. Through the little telescope of my HADLEY's quadrant it appeared as bright as *Capilla*.

	Apparent time correct. h ′ ″
1777, 1st July, *Venus* passed the meridian - - - -	21.30.41,5
14th, *Venus* visible to the naked eye, and has been so three days	
Passed the meridian - - - - - - - - -	21.01.02,0

Distances from the Sun, measured with an HADLEY's *Quadrant.*

	h ′ ″
West limb 41° 57′ - - - - - - - - -	21.21.58,5
East do. 42° 29′ - - - - - - - - -	25.08,5
15th, Passed the Meridian - - - - - - -	20.59.29
16th, do. - - - - - - - - - -	58.08,5
17th, Still visible.	

Distances measured as before.

	h ′ ″
From nearest limb 42° 31′ - - - - - - -	0.08.10
From furthest do. 43° 05′ - - - - - - -	0.12.14

1780,

1780, 18*th March, an Appulſe of* Venus *to* Mars.

Inch. *Non.*		*Diſtances.* ′ ″		*Apparent Time correct.* h ′ ″
2,45,,3	=	15.17,2		7·39·33,9
2,45,,8	=	15.20,9		44·33,9
2,45,,5	=	15.18,7		49·33,9

N.B. The ſcale of the micrometer is divided into twentieth parts of an inch, and the nonius ſubdivides theſe into twenty-five parts each.

The next morning the *Sun*'s diameters were meaſured.

	Inch.	*Non.*
Horizontal	5,15 ,,	17,25
Vertical	5,10 ,,	21
Mean	5,15 ,,	06,625
Error of micrometer		+ 4
	5,15 ,,	10,625

Sun's diameter by Ephemeris 32′ 11″,6, from which the diſtances were calculated.

19*th March, Difference of Declinations, and right Aſcenſion.*

Inch. *Non.*		′ ″		*Apparent Time correct.* h ′ ″
4,20,,00	=	26.08,7	at	7·41·51,4
Mars paſſed the vertical wire				43·09,4
Venus do.				45·16,4

Mars was ſouth of *Venus*.

Obſervations of Mars.

An Appulſe of Mars to ϰ Libræ.

Inch. *Non.*		*Diſtances.* ′ ″		h ′ ″
1,00,,19	=	6.18,5		10.50.05
1,00,,17	=	6.17,0		10.58.05

The ſtar was weſt of *Mars*.

Obſervations

Obſervations of the Moon.

1775, 12*th January, An Occultation of* Aldeberan.

Immerſion, - - - - - - 8.54.55

I believe the watch was ſet by equal altitudes, but I have loſt the book in which the entry was made, and have only a copy of my obſervations as a regiſter of this and the next that follows.

15*th February, an Eclipſe of the* Moon.

h ′ ″

End 10.15.00,5, apparent time correct.

1776, 3*d March, an Occultation of* Regulus.

Not having an ephemeris at the time, the obſervation was accidental, and conſequently not prepared for. The tranſit inſtrument was but lately put up, and had not been much uſed, but it was the only reſource for time; accordingly, it was adjuſted truly as to level and wires, but it was not in the meridian accurately. Therefore, the tranſits of ſeveral ſtars were taken to determine the poſition of the inſtrument, and the error of that being known, the times could be corrected by a very eaſy rule, which I ſubjoin. Let x be the error in ſeconds at the horizon, a and b the ſines of the zenith diſtances of two ſtars, A and B the ſines of the polar diſtances, d the difference of the errors of the clock, as found from the obſerved and the calculated tranſit of thoſe two ſtars. Then $\frac{x\ a}{A}$ will be the ſpace at the equator for the equation to correct one, and $\frac{x\ b}{B}$ the ſame for the other, and the ſum of theſe two will be equal to $d \times 15$; or, which is the ſame thing, $\frac{x\ a}{15\ A} + \frac{x\ b}{15\ B} = d$. Whence for all ſmall angles $x = \frac{15 \times d \times A\ B}{a\ B + b\ A}$

ζ and γ *Leonis* were the two ſtars that were relied on for time and poſition, becauſe they paſs ſo nearly at equal diſtances from the zenith, that the mean of their errors of the clock would be ſo near to the true one, that any clock yet invented could not ſhew the difference actually.

The difference of their errors was 5″,6, and thence the error of the tranſit inſtrument was only 1246″,16 at the horizon; and the diſtance of the wires of the teleſcope is 1478″.

	Times of paſſing the middle wire.	*Equation for the error of the inſtrument.*	*Paſſage by calculation.*	*Error of clock.*
3d March.				
☽ Weſt Limb.	10.58.19,5	— 15,08		
η Leonis.	11.01.45,0	— 7,16	10.54.56,8	6.41,04
α Leonis.	03.11	— 14,07	56.15,9	6.41,03
ζ The Northern.	10.33			
ζ The Southern.	10.39	+ 3,01	11.04.00,6	6.41,41
γ The Southern.	14.04			
γ The Northern.	14.08	— 2,59	07.24	6.41,41
δ Urſæ Majoris.	13.08.48	+ 92,27	13.03.43,9	6.36,37
ε Urſæ Majoris.	48.40	+ 92,01	43.34	6.38,00
Immerſion.	14.02.39,5			
It was emerged, but I did not ſee the Emerſion.	52.30			

6th March, Equal Altitudes, by an HADLEY's *Quadrant and Quickſilver.*

Quadrant.

° ′		h ′ ″	
30,00	riſing, -	20.29.41	
	falling, -	27.42.30	6.05,5
° ′			
30.30	riſing, -	20.32.14	
	falling, -	27.39.56	6.05,0
	Mean, -		6.05,25
	Equation of equal altitudes, -		- 7,10
			5.58,15

This compared with the error of the clock by ζ and γ, ſhews that it was loſing 17,″06 daily; at which rate, to the time that ε Urſæ Majoris paſſed the meridian, it muſt have loſt 1,″95, and the error by ε ought to have been 6.′39,″4. The difference is only 1,″4, which is not greater than the errors of obſervation may ſometimes be in ſtars of great declination.

Reſult.	*Apparent time correct.*
	h ′ ″
☽ Weſt limb paſſed the meridian - - -	10.51,23
Regulus, - - - - -	56.15,5
Immerſion, - - - - -	13.56.00,15

And emerged in leſs than 50′.

1776,

1776, 30*th July*, *An Eclipſe of the* Moon.

Beginning of total darkneſs.

	Apparent time correct. h ′ ″
By eye,	17.00.49
By teleſcope,	01.16

Clouds prevented any other obſervations.

1777, 20*th January*, *An Occultation of* ζ Geminorum *by the* Moon.

	Apparent time correct. h ′ ″
Immerſion,	13.37.38,6

23*d January*, *An Eclipſe of the* Moon.

	Apparent time correct. h ′ ″
Eclipſe began,	8.41.21,7
Shadow well defined,	44.33,7
Mare Humorum touched,	49.13,7
Grimaldus, do.	50.43,7
Grimaldus paſſed,	53.18,7
Mare Humorum, do.	53.33,7
Tycho's dark circle touched,	56.13,7
Tycho's body, do.	56.40,7
Copernicus, do.	9.26.28,7
Do. paſſed,	33.23,7
Going off again.	
Copernicus paſſed,	10.12.58,5
Grimaldus, do.	21.23,5
Mare Humorum touched,	36.17,5
Ariſtæus paſſed,	37.33,5
Mare Humorum, do.	47.23,5
Regiomontanus, do.	11.00.08,5
Tycho's body,	02.33,5
Tycho's dark circle paſſed,	05.38,5

Vendelin,

	h ′ ″
Vendelin, do.	12.23,5
Faint Penumbra remained,	32.25,5
Limb clear. End,	33·33,5
☽ Weſt limb paſſed the meridian,	12.03.22,7
Eaſt do. do.	05.38,2

The times are thoſe of the ſhadow's edge, unleſs it be otherwiſe expreſſed.

1777, 13*th February*, *An Occultation of* μ Ceti.

	Apparent time correct. h ′ ″
Immerſion,	7·53·46,7

I was very certain of the time of the immerſion. Five ſeconds before it, the ſtar began to change colour and to loſe light ſenſibly; one ſecond before the immerſion, it was conſiderably broader and redder than at firſt: and the light was not ſo ſtrong as before.

This ſupports the ſuppoſition of an atmoſphere round the moon, though it does not extend to any great diſtance. It has been doubted, and is I believe not yet abſolutely admitted. But our atmoſphere may be doubted by an inhabitant of the moon, for if to its greateſt extent, ſuppoſed 45 miles, it were of the ſame denſity as at the ſurface of the earth, which is not the caſe, it would not ſubtend a minute, as the earth is 8000 miles in diameter, and the greateſt parallax only 62′.

1777, 16*th May*, *An Appulſe of the* Moon *to* ν Scorpii.

	Apparent time correct. h ′ ″
☽ Weſt limb paſſed the meridian,	7·59.50,1
ν Scorpii do.	8.00.02,1

By the arch of the tranſit inſtrument, the ſtar was 10′ from the limb.

1779, 1*ſt May*, *An Appulſe of the* Moon *to* Mars *and* Saturn.

Having brought the *Moon*'s limb to run along a wire of declination,

	Apparent time correct. h ′ ″
The eaſtern limb paſſed the vertical wire,	10.23.09,5
Saturn paſſed the ſame,	10.23.21,5

Saturn did not come within the ſcale of the micrometer.

For

For the right Aſcenſions.

		Apparent time correct. h ′ ″
Mars	Paſſed the meridian at - -	12.55.42
Saturn		56.34
☽ Eaſtern limb		57.36

Diſtances of the Moon *and* Mars.

Inch.	Non.	′ ″		Apparent time correct.
4,70	08,5	= 28.40,3	———	13.18.42,5
4,65	21,	= 28.31,1	———	26.34,5
4,65	15	= 28.26,7	Mean of the three times and the ſame meaſure,	31.53,5
4,65	21	= 28.31,1	———	36.49,5
4,70	05	= 28.37,7	———	41.06,5

1779, 3*d May*, *An Appulſe of the* Moon *to* β Ophiuchi.

Difference of Declination.

Inch.	Non.	′ ″		Apparent time correct.
4,70	17	= 28.09,9	———	10.22.58,1

The ſtar was to the weſt of the *Moon*'s horn from which the diſtance was meaſured, becauſe the micrometer could not take in the limb.

Inch.	Non.	′ ″		Apparent time correct.
4,60	17	= 28.09,9	———	10.22.51,1

Examination of the Micrometer.

	Inch.	Non.
1ſt May, 19. 29. leſſer diameter of the *Sun*, - -	5,2	13
Again, - - - -	5,2	15
Greater diameter, - - -	5,2	23
Again, - - - -	5,2	24
Hence mean diameter -	5,2	17,5

There are twenty-five nonius to divide one twentieth of an inch.

When the limbs coincided, the Zero's agreed.

The ephemeris gives 15′.54″,6 for the ſemi-diameter, therefore one nonius is equal to 0″,7294.

1779,

1779, 23*d November*, *An Eclipſe of the* Moon.

	Apparent time correct.
	h ′ ″
Beginning,	12.02.33,0
Shadow well defined,	03.36,0
Ariſtarchus,	10.37,9
Inſula Ventorum	12.14.32,9
Copernicus,	21.18,9
Mare Vaporum,	32.07,8
Bright ſpot in Mare Vaporum,	34.27,7
Tycho's body touched,	35.29,7
Mare Serenitatis, do. the border,	35.47,7
Tycho paſſed,	36.52,7
Mare Tranquilitatis touched,	40.17,6
Ariadæus,	41.37,6
Mare Serenitatis paſſed,	44.07,6
Meerob,	51.37.5
Mare Criſium touched,	52.37.5
Do. paſſed,	56.40,4
Total Darkneſs by eye,	13.00.37,5
By teleſcope,	01.41,3
Do. end by teleſcope,	14.40.13,3
By eye,	41.16,3
Grimaldus paſſed,	43.06,3
Ariſtarchus,	50.42,2
Inſula Ventorum touched,	53.46,2
Paſſed,	54.20,2
Copernicus,	15.02.44,1
Tycho's body touched,	04.56,0
Paſſed,	06.23,0
Mare Criſium touched,	32.22,7
Paſſed,	35.55,7
Mare Fæcunditatis paſſed,	37.23,6
End by teleſcope, doubtful,	39.45,6
Certain	42.00,6

The

The apparent times here noted in theſe obſervations were derived from the mean times. The difference between the clock and mean time being applied to the hours ſhewn by the clock. And as the difference or equation was derived from the tranſit inſtrument, here follows an examination of its poſition.

	Tranſits over the middle wire by clock.	*Difference between the clock and mean time.*
	h ′ ″	
22d November.		
⊙ Weſt Limb.	23.42.34	
Eaſt do.	44.53	
Center.	23.43.43.5	
Eqtn. time.	0.13.19,5	
		′ ″
		— 2.57 to be added to all the tranſit hours.
23d November.		
α Arietis.	9.42.02	
☽ Weſt Limb.	11.38.28	
☽ Eaſt do.	40.51	
Rigel.	12.50.41	
Bellatrix.	13.00.01	
Caſtor.	15.06.51	
Procyon.	14.05	
1ſt December.		
⊙ Weſt limb.	23.45.26	
Eaſt do.	47.47	
Center.	23.46.36,5	
Eqtn. of time.	10.17,7	′ ″ —3.05,8

Equal Altitudes with the Quadrant which has only one Wire.

N.B. Before and after this laſt tranſit.	*Another altitude not moved.*
h ′ ″	h ′ ″
Riſing U limb. 20.16.41	20.23.47
L limb. 20.19.38,5	20.26.46,5
Falling L limb. 27.13.27	27.06.17
U limb. 27.16.23	27.09.19
Center. 23.46.32,4	23.46.32,4
Equation of equal altitudes,	+ 4,37
	23.46.36,77

	Apparent time correct.
	h ′ ″
1780, 18th February, ☽ Eaſt limb paſſed the meridian - -	10.39.31,6
15th April, ☽ Weſt limb paſſed the meridian - -	9.17.34

5th

5th Auguſt, an Appulſe of the Moon *to* Jupiter.

	h ′ ″
☽ Weſt limb paſſed a circle of the meridian,	7.14.44
Jupiter's weſtern limb,	14.48
Eaſtern do.	14.58
Center,	18.49
☽ Weſt limb,	00.53
Jupiter's center,	25.06
☽	25.19
Jupiter's center,	42.31
☽	43.08
Jupiter,	51.21
☽	52.15
Jupiter,	8.42.22
☽	44.42
The difference of declination of *Jupiter*, and the neareſt horn of the *Moon*, was 9′.01″,4 at	7.28.40

Diſtances of Limbs.

′ ″	
14.33,2	7.32.12
15.01,5	35.36
15.32,7	38.53
16.25,9	44.31
17.06,5	48.16
30.58,6	8.35.49

OBSERVATIONS *at large for determining the Latitude of the* TREASURY GATE *in* FORT WILLIAM *in* BENGAL.

	Face East.	*Face West.*	*Mean or observed altitude.*	EQUATIONS. *Refraction.*	*Aberration.*	*Nutation.*	*Altitude correct.*	*Declination.*	*Latitude.*	
					+	—				
γ Tauri.	° ′ ″ 80.57.37,3	° ′ ″ 89.58.16	° ′ ″ 89.57.56,6	″ 0	″ 2,34	″ 0,43	° ′ ″ 89.57.54,7	° ′ ″ 22.30.56,4	° ′ ″ 22.33.01,7	N. B. Face east, 15th Jan. 1779, when the barometer was 30,50, and the thermometer 63,5.
τ Tauri.	88.41.47	88.42.28	88.42.07,5	1,2	+ 0,82	— 0,63	88.42.06,5	21.15.26,2	19,7	
o Tauri.	89.09.49,7	89.11.04	89.10.26,9	0,7	+ 0,95	— 0,39	89.10.25,1	21.43.46,5	21,4	
ζ Tauri	88.25.48,8	88.26.45,0	88.26.16,9	1,4	+ 0,7	+ 0,7	88.26.16,9	20.59.23	06,1	
132 Tauri.	88.05.07,9	88.04.17	88.04.42,5	2,9	+ 1,11	+ 1,05	88.04.41,8	24.28.25,9	07,7	
η Geminorum.	89.18.11,7	89.17.08	89.17.39,8	0,6	+ 0,16	+ 1,49	89.17.39,8	23.15.25,3	05,1	
μ Geminorum.	89.57.17,3	89.55.58,0	89.56.37,6	0	+ 0,44	+ 2,03	89.56.40,4	22.36.32,7	13,1	Face west 19th Jan. when the barometer was 30,50, and the thermometer 65, agreeably to which the refraction is taken.
ν Geminorum.	87.46.28,2	87.47.17	87.46.52,6	2,2	+ 0,84	+ 2,6	87.46.53,8	20.20.00,3	06,2	
								Mean -	22.33.09,4	
Aldeberam.	83.29.09,7			6,7	+ 0,82	— 0,63	89.29.03,2	16.02.58 N.	22.33.54,8	
Rigel.	58.57.52,2			33,7	— 5,1	+ 0,12	58.57.13,8	8.28.15,9S.	34.30,3	
α Orion.	74.47.00			15,3	— 2,2	+ 1,28	74.46.43,8	7.20.57 N.	34.13,8	
γ Geminorum.	84.00.29,9			6,0	+ 2,5	+ 2,00	84.00.28,4	16.34.11 N.	33.47,6	
Syrius.	51.00.43,5			45,5	+ 4,6	— 2,75	51.00.00	16.25.04,3S.	34.15,7	
								Mean -	22.34.07,4	
Capella.		66.47.18		23,5	+ 6,8	— 0,06	66.47.00,3	45.45.12,5	22.32.12,8	
β Tauri.		84.08.43		5,6	+ 2,4	+ 0,37	84.08.40,2	28.24.08	48,2	
136 Tauri.		84.59.37,1		4,8	+ 1,2	+ 1,2	84.59.34,7	27.32.27,1	01,8	
θ Aurigæ.		75.21.42,8		15,0	+ 2,4	+ 1,2	75.21.31,4	37.10.34	05,4	
ε Geminorum.		87.12.30		2,9	— 0,4	+ 2,6	87.12.29,3	25.19.52,4	11,7	
								Mean -	22.32.16	
								Mean of the last two sets,	22.33.11,7	
								Double collimation or difference of the last two sets,	1.51,4	
								Latitude by the whole,	22.33.10,55	

TRIVATOORE.

Observations by T. D. P. 1783.

	Day.	h ′ ″	′ ″
⊙ On the meridian, December	5,	23.33.52,5, flow,	26.07,5
⊙ On the meridian, December	6,	23.35.53,1, flow,	24.06,9
Daily gain			2.00,6

The equation of equal altitudes was applied.

An emerſion of Jupiter's *firſt Satellite.*

	h ′ ″
6th December, by watch emerged,	6.31.53
Too flow at noon,	+26.07,3
Gain till obſervation,	— 34,4
Emerſion,	6.57.25,9
Ephemeris,	1.36.52,0
Longitude in time,	5.20.33,9
In degrees	° ′ ″ 80.08.28,5

	h ′ ″		′ ″
⊙ On the meridian, December 28,	23.26.37		
Equation of E. A.	— 1,9		
	23.26.35,1,	flow,	33.24,9
⊙ On the meridian, December 30,	23.23.40,3		
Equation of E. A.	— 1,9		
	23.23.38,4,	flow,	36.21,6

Daily loſs, - ″ 88,4

An emerſion of Jupiter's *firſt Satellite.*

	h ′ ″
29th December, by watch emerged,	6.27.07
Too flow at noon -	33.24,9
Loſs till obſervation at 88,4	25,8
Emerſion -	7.00.57,7
Ephemeris, -	1.40.44,0
Longitude in time,	5.20.13,7

In

	In degrees, -	80°.03'.24",6
The mean of the two Longitudes,	-	80.05.56,5

The diſtance between the flag in the fort, and the place of obſervation at *Trivatoore*, was determined by a long baſe meaſured in the ſands, and by taking angles for trigonometrical calculations.

Madras flag, diſtance, - - -		2787,1 feet.
Bearing, - - -		S. 10.33.50 W.

Which give difference of Longitude, 50",5.
Latitude, 4'.30",7.

VIPEREE.

Having borrowed the quadrant that Mr. HURST uſed in the tranſit of *Venus*, I was deſired not to alter its line of collimation till I had determined the quantity of error: thoſe obſervations are in the tables of latitude. It was uſed in the ſurvey to *Calcutta*.

As I intended to obſerve at this place, I determined its diſtance from the fort, as accurately as I could by trigonometry. The reſult is:

Madras flag, diſtance, - - -		8072,2 feet.
Bearing, - - -		S. 23,15,00 E.

Which give difference of Latitude 31",5

MADRAS.

Latitude of *Trivatoore*, ſee table, - - - -		13°.09'.00",4
Madras ſouth of it, - - - -		— 4.30,7
Latitude -		13. 4.29,7
Latitude of *Viperee*, ſee table, - - - -		13.05.05,4
Madras ſouth of it, - - - -		— 31,5
Latitude, -		13.04.33,9

Mean 13.04.31,8.

Longitude of *Trivatoore*, Mean, - - - -		80.05.56,5
Madras weſt of it, - - - -		— 00.50,5
Longitude, -		80.05.06,0

WUNGOLE,

WUNGOLE, 1782, *commonly called* ONGOLE.

Obſervations by T. D. P.

14th November, double altitudes of the pole, with the ſmall ſextant made by RAMSDEN, and the artificial horizon.

Watch.	*Angles.*	
9.16.12	34.45.30	
21.00	47.30	theſe were with the ſmall ſextant.
31.00	45.30	
49.00	46.30,	this was with the large ſextant.
9.29.18	34.46.15	
	17.23.08	
	+ 2.40	* beneath meridian.
	— 2.58	refraction.
	17.22.50	meridian altitude.
	1.51.13	polar diſtance.
	15.31.37	Latitude.

16th November, with the octant double altitudes of the *Sun*.

	Upper L.	*Lower L.*
	° ′ ″	° ′ ″
12.00.28	111.51.00	
2.24	54.00	
4.14		110.48.20 M. A.
5.41	111.56.00 M. A.	
6.36		110.47.00

Obſerved

Obſerved altitude,	-	55.41.05
Ref. and par.	-	— 34
Meridian altitude correct,	- -	55.40.31
Declination,	- -	S. 18.49.05
Co. Latitude,	- -	74.29.36
Latitude,	- -	15.30.24

1784, The Latitude obſerved by T. D. P. (ſee obſervations at large) was,

15.29.16

This is inſerted only to bring to teſt the accuracy of the octant, which is mentioned (page 8) in the introduction: and it appears, that by a ſingle obſervation made with it, the Latitude was determined within 1'.8".

It ſerves alſo to ſhew that, though it is very difficult to take double altitudes of ſo faint a ſtar, in low latitudes, even the polar ſtar may be uſed to great advantage: and in theſe hot climates, the ſtars only can be employed, for the *Sun*'s heat at noon, after a long march, is really not to be borne by any conſtitution.

MASULIPATAM, 1782. *By* T. D. P.

27th October, ⊙ diameter forward 33, Backward 32, } then ſet the ſpeculum to 90°, and ſhifted the index back.

Double altitudes of the *Sun*'s lower limbs taken with the HADLEY's octant and the artificial horizon.

Watch.	*Angles.*	
h ' "	° ' "	
12.19.21	120.52.20	
20.32	120.55.20	
28.17	121.21.00	
30.40	121.23.30	
31.38	121.24.00	
32.34	121.25.40	Meridian.
34.23	121.23.20	

Obſerved

Observed meridian altitude,	L. L.	60.42.50
Error of quadrant,		— 30
Semi-diameter,		+ 16.10
Ref. and par.		— 27
Altitude,		60.58.03
Declination,	S.	12.51.09
Co. Latitude,		73.49.12
Latitude,		16.10.48

28th October, quadrant the same as above.

The mode the same, double altitude,		120.45.00
Meridian altitude correct,		60.37.42
Declination,	S.	13.11.55
Co. Latitude,		73.49.37
Latitude,		16.10.23

1st November, ⊙ diameter, 34 forwards, 33 backwards, } then set the speculum to 90°.

Time. h ′ ″	*Upper L.*	*Lower L.*
12.14.56		
	119.13.10	
15.33		118.04.30 M. A.
16.11	119.14.50 M. A.	

Observed meridian altitude,		59.19.50
Ref. and par.		— 30
Error of quadrant,		— 30
Meridian altitude,		59.18.50
Declination,	S.	14.30.45
Co. Latitude,		73.49.35
Latitude,		16.10.52

The

The ſame day Lieutenant HUMPHRYS obſerved a ſextant made by RAMSDEN, about four inches radius; he made the angles of the lower limb 118°.09'.00", and the error of his quadrant was —2', which gave the latitude 16°.11'.05". This was intended as a kind of teſt of the inſtruments, but it was not a fair one, and yet the reſult is cloſer than could be expected, conſidering the difficulty of reading the ſmall one.

Mean of three latitudes with octant - 16°.10'.32"

⊙ On Meridian, October 29th,	00h.04'.56"	too faſt	- -	4'.56"
By the ſmall watch, —— 30th,	00.08.36,5	-	- -	8.36,5
—— 31ſt,	00.12.37	-	- -	12.37
November 1ſt,	00.16.36,5	-	- -	16.36,5

Examination of the large watch uſed at the obſervation of *Jupiter*'s Satellite.

29th October, altered the ſpring and ſet it a-going at one o'clock.

	Small watch.	*Large watch.*		
	h ' "	h ' "		
October 29th, - -	22.37.00			
Too faſt, - - -	8.23,2			
Solar time, - - -	22.28.36,8	22.34.42	too faſt, -	6.05,2
	h ' "			
November 1ſt, - -	1.46.00			
Too faſt, - - -	0.16.54			
Solar time, - - -	1.29.06	1.35.57,5	too faſt, -	6.51,5

Therefore in 51 hours ſolar time, the large watch gained 46",3.

An emerſion of Jupiter's *firſt Satellite.*

	h ' "
1ſt November, by watch emerged, - - -	7.27.20
At laſt obſervation, too faſt, - - -	— 06.51,5
Gained afterwards at 46",3 - - -	— 05,3
Emerſion, -	7.20.23,2
Ephemeris, -	1.56.15
Longitude in time, -	5.24.08,2
In degrees, -	81°.02'.03"

The

The obſervations before written were made at the Chief's garden. The Fort flag was diſtant 2′,5″ in a ſtrait line, and bore S. by E. which give difference of

Longitude,	+ 30″
Latitude,	— 2′.28″

Longitude of Gardens,	81.2.03
	+ 30
Longitude of Flag,	81.2.33
Latitude of Gardens,	16.10.32
	— 2.28
Latitude of the Flag,	16.08.04

PEDDAPOORE, 1784.

Obſervations by T. D. P.

	h ′ ″
α Serpentis, on the meridian, June 18th	9.36.45
Do. 19	9.28.57,5
	7.47,5
Accelleration for the time,	4.09,4
Loſs in one day,	3.38,1

⊙ On the meridian, June 18,	h ′ ″ 23.51.47,75,	flow,	′ ″ 8.12,25

An immerſion of Jupiter's *Firſt Satellite.*

The planet was extremely bright, and the Belts diſtinct and clear; the glaſs perfectly ſteady.

	h ′ ″
19th June, by watch changed colour,	15.16.22
Immerged,	15.18.38
Too ſlow at noon,	+ 8.12,25
Loſs to obſervation at 219,	+ 2.21
Immerſion,	15.29.11.25
Ephemeris,	10.00.13
Longitude in time,	5.28.58,25
In degrees,	° ′ ″ 82.14.34

From

From the obſervations at *Calcutta*, it appears that there is a difference between the Longitudes derived from obſervations of immerſions and emerſions.

	h ′ ″
The mean of Longitudes, 10 in number, derived from obſervations of immerſions, with an 18-inch reflector, was, - -	5·53·53,77
Of emerſions (2) with the ſame inſtrument, - -	5·53·43, 4
The ſingle immerſion with *Dollond*'s triple object glaſs, is, -	5·53·57, 8
The mean of 4 emerſions with the ſame, - - -	5·53· 3, 9
Difference by the reflector, - - - -	0. 0.10,77
By *Dollond*'s refractor, - - - - -	00.00.54,90
The mean of all the immerſions, (11) - - -	5·53·54,13
Emerſions, (6) -	5·53·17, 4
Difference, -	36,73

As the glaſs with which the obſervation was made, differed from both, the difference derived from the whole is to be preferred, and ſo 9′.25″ are to be ſubtracted from this, to compare it with the other places, which were all emerſions, and then the Longitudes of *Peddapore*, by emerſions, will be 82°.05′.19″.

KOSSIM KOTTA, 1782.

Obſervations by T. D. P.

9th October, Double altitudes of *Jupiter* from the artificial horizon.

h ′ ″		° ′ ″		h ′ ″
7.47.00	—	55.10.00		
48.36	—	54.28.50	*Jupiter*'s R. A. at the time, -	17.32.06,7
49.57	—	54.01.20	Declination, do. - -	S. 23.12.10
50.58	—	53.37.10	⊙ R. A. at do. - -	13.00.24,8
52.02	—	53.13.10	Latitude, - - -	17.42.30
53.05	—	52.50.00	Derived from the obſerved Latitudes of *Elmulchillie* and *Sobaurum*.	
7.50.16	Mean,	26.56.43	Apparent altitude.	
		— 1.51	Ref.	
		26.54.52		

	h ′ ″
From the above data the planet had paſſed the meridian, -	3.16.37,3
Jupiter's R. A. - - -	17.32.06,7
	20.48.44
☉ R. A. - - -	13.00.25
Time, -	7.48.19
Watch, -	7.50.16
Too faſt, -	1.57

The watch gained 12″ daily by the meridian of *Vizacpatam*.

An Emerſion of Jupiter's *firſt Satellite.*

	h ′ ″
9th October, By clock emerged, - - -	7.11.45
Too faſt at the obſervation, - -	— 1.57
Emerſion, - -	7.09.48
Ephemeris, - -	1,38.00
Longitude in time, - -	5.31.48
In degrees, - -	82°.57′.00″

VIZACPATAM, 1782.

Obſervations by T. D. P.

An Emerſion of Jupiter's *ſecond Satellite.*

	h ′ ″
3d October, emerged, - - - -	8.30.58
Ephemeris, - -	2.57.20
Longitude, - -	5.33.38
83°.24′.30″	

An

An Immerſion of Jupiter's *third Satellite.*

	h ′ ″
7th October, immerſion, - - - -	8. 9.57

The time was ſhewn by Mr. RUSSELL's time-keeper, which was made by ARNOLD, and was regulated by the meridian line in his hall.

7th September, An Emerſion of Jupiter's *firſt Satellite.*
By T. D. P. 1784.

	h ′ ″
7th September, by watch emerged, - - -	8.23.38
Sky remarkably clear and glaſs ſteady. Full ſplendor, - -	25.40

Obſervations for time.			*Zenith diſtance.*
	h ′ ″		° ′ ″
7th September, ⊙ U. L.	22.22.25	By arch of 90, -	41.29.20
	24.48	96, -	44.01.01
			D. S. D. Non.
Latitude by 2 northern ſtars,	See obſervations at large		17.44.33,4
2 ſouthern ſtars,	under *Vizacpatam.*		17.38.46,5
N. B. Refraction, + 50″	True Latitude, - -		17.41.45
	Error of Collimation, - -		+ 02.58
⊙ Declination for the time and place, - - - -			N. 5.30.39
			h ′ ″
From the above data, the time was, - - - -			21.17.15,5
	By the watch, - -		20.23.36,5
	The watch too ſlow, - -		53.39

Day.	*Middle wire.*	*Upper wire.*		
	h ′ ″	h ′ ″		
8th September, α *Aquilla* riſing, -	7.01.13	7.03.16		
Falling, -	8.07.35	8.05.30		
				h ′ ″
On the meridian, -	7.34.24	7.34.23	=	7.34.23,5
Paſſage by calculation, - - - - -				8.29.55,5
Watch too ſlow, - - -				55.32

8th

8th September, ⊙ zenith distance.

	h ′ ″		D. S. D. Non.	Zenith distance. ° ′ ″
⊙ L.	19.13.55	90		56.59.20
⊙ U.	16.06	96	60.03.05	56.59.23
U.	16.49	90		56.18.20
L.	19.00	96	60.00.07	56.18.04,6
U.	21.57	90		55.05.00
L.	24.09	96	58.03.00	55.04.41,2
U.	25.18	90		54.18.00
L.	27.28	96	57.03.20	54.17.12,7
	19.20.20		Mean,	55.40.00,3

⊙ Declination, - N. ° ′ ″ 5.09.42

Latitude, - 17.41.45

From the above data, time, - h ′ ″ 20.17.30

Watch, - 19.20.20

Watch slow, - 57.10

Therefore the watch lost in h ′ 22.57 - ″ 211,0

And consequently daily, - - 221,0

Day.	h ′ ″		h ′ ″	h ′ ″
8 at	7.34.23,5	watch too slow,	55.27.9	
7 at	8.23.38	the emersion happened	-	0.55.32,0
Difference,	23.10.45,5	loss in this time, at 221,	-	— 3.33
		Therefore slow at emersion,	-	51.59
		Emersion by watch,	-	8.23.38
		Time of emersion,	-	9.15.37
		Ephemeris,	-	3.42,56
		Longitude in time,	-	5.32.41
		In degrees,	-	° ′ ″ 83.10.15

October

October 23d, An Obſervation of Jupiter's *firſt Satellite, by Mr.* MAXTON.

The glaſs the ſame as mine: and the watch corrected by Mr. RUSSELL's meridian line.

		h ′ ″
Emerſion by watch,	-	10.5.30
Watch faſt,	-	6.05
Emerſion,	-	9.59.25
Ephemeris,	-	4.26.08
Longitude in time,	-	5.33.17
In degrees,	-	83°.19.15″.

This was the inſtant of firſt appearance, as well as Lieut. COLEBROOKE's, who obſerved the ſame at *Vizianagarum* palace.

		° ′ ″
Longitude by T. D. P.	-	83.10.15
by M.	-	83.19.15
Mean,	-	83.14.45

Mr. RUSSELL alſo made an obſervation, which I do not uſe, becauſe he noted the time of full ſplendor, which is uncertain; it follows:

		h ′ ″
16th October, Watch faſt at noon,	-	1.43,5
Gained daily,	- 56″,5	
Add its gain to the obſervation,	-	18,5
Watch faſt,	-	— 2.02
Time of full ſplendor,	-	8. 4.39
Time of obſervation,	-	8. 2.37
Ephemeris,	-	2.29.17
Longitude in time,	-	5.33.20
In degrees,	-	° ′ ″ 83.20.00

BEEMUL-

BEEMULWILSA, 1784.

Observations by Lieutenant COLEBROOKE.

		h ′ ″		′ ″
☉ On meridian, Auguſt 7th,	-	23.40.23,15		
Equation of E. A.	-	+ ,60		
		23.40.23,75	ſlow, -	19.36,25
☉ On meridian, Auguſt 12th,	-	23.22.30, 5		
Equation of E. A.	-	+ 0,75		
		23.22.31,25	ſlow, -	37.28,75
		Loſs in 5 days,	-	17.52.50
		Daily loſs,	-	3.34, 5

An Immerſion of Jupiter's *ſecond Satellite.*

This was with his firſt obſervation.

		h ″ ′
8th Auguſt, by watch immerged, -	-	12.33.20
Too ſlow at noon,	-	19.36,25
Loſs to the obſervation, at 214″,5	-	1.55, 2
Immerſion,	-	12.54.51,45
Ephemeris,	-	7.20.50
Longitude in time,	-	5.34,01.45
In degrees,	-	° ′ ″ 83.30.15,00

Auguſt 13th, by T. D. P.

		h ′ ″
Jupiter's firſt Satellite vaniſhed by the watch,	- -	11.32.28

6 or 8 ſeconds before the time noted, it had not changed colour: a cloud came on and hid it for about 8 ſeconds, and when it was gone, the Satellite had vaniſhed.

Auguſt 20th, by T. D. P.

		h ′ ″
Jupiter's firſt Satellite vaniſhed by the watch,	- -	14.2.30

The

The ſky was clear, the glaſs ſteady: here I expected what happened, and was on my guard. The Satellite vaniſhed at a ſmall diſtance from the body, *i. e.* before the contact, and without changing colour.

	Day.	h ′ ″		
⊙ On meridian, Auguſt	19th, -	23.57.13,25		
Equation of E. A. - -		+ 1, 5		
19th, - -		23.57.14,75	flow, -	2′.45″,25

Immediately before this obſervation, the watch was ſet forward one hour without ſtopping it. By comparing this with the obſervation of the 12th, the watch loſt daily, 3′.36″,6.

The foregoing obſervation of time, is only of uſe for the erroneous immerſions of the 13th and 20th.

	Day.	h ′ ″		
⊙ On meridian, Auguſt	27th, -	23.41.26,5		
Equation of E. A. - -		+ 2,1		
27th, - -		23.41.28,6	flow, -	18′.31″,4
	Day.	h ′ ″		
⊙ On meridian, Auguſt	29th, -	23.35.17,5		
Equation of E. A. - -		+ 2,4		
		23.35.19,9	flow, -	24′.40″,1

Daily loſs, - 3′.04″,4

An Emerſion of Jupiter's *firſt Satellite, by Lieutenant* COLEBROOKE.

	h ′ ″
29th Auguſt, by watch emerged, - - - - -	12.27.00
Too ſlow at noon, after the obſervation, - - -	+ 24.40,1
Loſs after the obſervation, - - - -	− 1.25,5
Emerſion, -	12.50.14,6
Ephemeris, -	7.16.33
Longitude in time, -	5.33.41,6
In degrees, -	° ′ ″ 83.25.16

Obſervations

Obſervations by T. D. P.

☉ On the meridian, September 2, -	$23^h.20'.47''$		
Equation of E. A. -	+ 02,5		
	23.20.49,5	ſlow, -	39′.10″,5

☉ Altitude, 5th September, -	$21^h.53'.55'',5$	$67^\circ.31'.35''$
Refraction and parallax, -		− 20
Collimation, -		+ 51
		67.32.06
☉ Declination at the time and place, - -		6.14.26
Latitude, -		17.53.32

From which data, the time was, -	$22^h.41'.10'',0$	
By the watch, -	21.53.55,5 ſlow, -	47′.20″,5

Whence the daily loſs was, - 167″,7

An Emerſion of Jupiter's *firſt Satellite.*

The ſky clear of clouds, and the glaſs ſteady, but the vapours had a perceptible motion through the teleſcope: the Belts were very diſtinct.

5th September, by watch emerged, - - - -	$14^h.00'.35''$
N. B. Full ſplendor, $14^h.2'.15''$. Too ſlow at the altitude of the ☉ taken after the obſervation,	+ 47.20,5
Loſs after the obſervation, at 167″,7 -	− 54,4
Emerſion, -	14.47.01,1
Ephemeris, -	9.13.36
Longitude in time, -	5.33.25,1
In degrees, -	$83^\circ.21'.18''$

Obſervations

Observations by Lieutenant COLEBROOKE.

⊙ On the meridian, September 29th, -	$23^h.38'.27'',6$			
Equation of E. A. -	+ 5,4			
	$23^h.38'.33'',0$	flow,	-	$21'.27'',0$
Equation of time, -	$23^h.49'.46'',4$			
		flow,	-	11.13,4
⊙ On the meridian, October 1st, -	$23^h.32'.17'',3$			
Equation of E. A. -	+ 5,7			
	$23^h.32'.23'',0$	flow,	-	$27'.37'',0$
Equation of time, -	$23^h.49'.08'',6$			
		flow,	-	16.45,6

Daily loss on solar time, - $3'.05'',1$

An Emersion of Jupiter's *first Satellite.*

30th September, by watch emerged, - - -		$9^h.15'.10''$
Too slow at noon, -		+ 21.27
Loss till observation, at $185'',1$, -		+ 1.15
Emersion, -		$9^h.37'.52''$
Ephemeris, -		4.05.02
Longitude in time, -		$5^h.32'.50''$
In degrees, -		$83°.12'.30''$

I suspect that a mistake was committed in writing down the time, and that it ought to have been $9^h.16'.10''$. But this is as it is entered in the original book.

13th October, at $1'.48''$ set the watch forward one hour without stopping it.

⊙ On the meridian, October 15th, -	$23^h.51'.53'',5$			
Equation of E. A. -	+ 6,8			
	$23^h.52.00,3$	flow,	-	$7'.59'',7$
Equation of time, -	$23^h.45.31,7$	fast,	-	6.28,6

The obſervation of the ⊙ paſſage over the meridian was not taken on the next day after the emerſion as uſual, and between the 17th and 18th the watch ran down. Therefore the rate is aſcertained from the mean time, compared with the 29th September, and 1ſt October.

And the watch loſt by the 1ſt,	-	173″,6 daily.
By the 2d,	-	174,7
Mean,	-	174,2
Daily variation,	-	+11,5
Daily loſs on ſolar time,	-	185,7

An Emerſion of Jupiter's *firſt Satellite.*

		h ′ ″
16th October, by watch emerged,	-	7·53·35
Too ſlow at noon,	-	+ 7·59,7
Loſs till obſervation, at 185″,7,	-	+ 1.01,9
Emerſion,	-	8.02.36,6
Ephemeris,	-	2.29.17,0
Longitude in time,	-	5.33.19,6
		° ′ ″
In degrees,	-	83.19.54

Reſult of the Obſervation of Longitude.

			° ′ ″	° ′ ″
29th Auguſt,	COLEBROOKE,	-	83.25.16	83.25.16
5th September,	PEARSE,	-	83.21.18	83.21.18
30th do.	COLEBROOKE,	-	82.12.30	rejected.
16th October,	COLEBROOKE,	-	83.19.54	83.19.54
	Mean,	-	83.19.44,5	83.22.09,3

VIZIAN-

VIZIANAGARUM PALACE.

An Obſervation of Jupiter's *ſecond Satellite, by* T. D. P.

			h ′ ″
22d October, by watch emerged	-	-	7.16.06
Full ſplendor,	-		18.18

Obſervations by Lieutenant COLEBROOKE.

Equal altitudes.

		h ′ ″		
* *Fumulhoot*, riſing,	-	7.48.10		
Falling,	-	9.44.25		
* On the meridian,	-	8.46.17,5		
By calculation,	-	8.54,35,5	flow, -	8′.18″
		h ′ ″		
⊙ On the meridian, 22d,	-	23.50.14,5		
Equation of E. A.	-	+ 7,0		
		23.50.21,5	flow, -	9′.38″,5
		h ′ ″		
23d October, * *Fumulhoot*, riſing,	-	7.51.39		
Falling,	-	9.29.05		
On the meridian,	-	8.40.22		
By calculation,	-	8.50.46,2	flow, -	10′.24″2
		h ′ ″		
⊙ On the meridian, 23d,	-	23.48.10,3		
Equation of E. A.	-	+ 7,6		
		23.48.17,3	flow, -	11′.42″,7
From the above, daily loſs,	-	125″,2		

An Emerſion of Jupiter's *firſt Satellite.*

					h ′ ″
By watch emerged,	-	-	-	-	9.48.55
					22d October,

22d October, *Jupiter*'s ſecond Satellite emerged, - -		^{h} 7.1′6.″06
By *Fumulhoot*, watch ſlow, -		+ 8.18
Loſs in 1^{h}.30′ after emerſion, at 125″,2 -		− 07,8
Emerſion, -		7.24.16,2
Ephemeris, -		1.49.57
Longitude in time, -		5.34.19,2
In degrees, -		$^{\circ}$ 83.34.′48
23d October, *Jupiter*'s firſt Satellite emerged, - -		^{h} 9.48.′55
By *Fumulhoot* too ſlow, -		+ 10.24,6
Loſs in 1^{h}.8′ after *Fumulhoot* paſſed at 125″,2 - -		+ 06,0
Emerſion, -		9.59.25,6
Ephemeris, -		4.26.08,0
Longitude in time, -		5.33.17,6
In degrees, -		$^{\circ}$ 83.19.′54,0

Mr. MAXTON obſerved this at Vizacpatam, and the two obſervations ſhew only 39″ difference of Longitude, but the high hill that lies to the north of the palace bore from *Beemulwilſa*, N. 8°.25′ E. and by trigonometry its diſtance was 22,978 miles, therefore it lay north of *Beemulwilſa*, 19′.28″ and eaſt 2′.52″. The palace lies 12′.20″,3 to the north by obſervations at large, and therefore to the eaſt 1′.48″. But *Beemulwilſa* lies to the eaſt of *Vizacpatam*. Mr. MAXTON's eye, it may be preſumed, is not ſo quick as Lieutenant COLEBROOKE's, and will ſuffice to account for the difference; for by a particular ſurvey round theſe parts, *Vizianagur* fort does lie 6′.36″ eaſt of *Vizacpatam*.

NARRAINPOOR.

Which by the table of the route lies weſt of *Vizianagarum* palace 2′.

Obſervations

Observations by Lieutenant COLEBROOKE, *for time.*

⊙ On the meridian, October 31ſt,	h ′ ″ 23.36.04,3			
Equation - -	+ 6,4			
	23.36.10,7	flow, -		23′.49″,3
November 1ſt, -	23.34.39,5			
Equation, -	+ 6,8			
	23.34.46,3	flow, - -		25.13,7
		Daily loſs -		1.24,4

An Obſervation of Jupiter's *firſt Satellite.*

Sky remarkably clear and glaſs ſteady.

	h ′ ″
31ſt October, emerged by watch - - - - - -	6.00.45
Too ſlow at noon, - - - - - -	23 49,3
Loſs till obſervation at 84″,4, - - - -	22,5
Emerſion, -	6.24.56,8
Ephemeris, -	51.26
Longitude in time,	5.33.30,8
	° ′ ″
In degrees, -	83.22.42,0

KALINGAPATAM, 1784.

Obſervations by Lieutenant COLEBROOKE, *for time.*

⊙ On meridian, November 7th, -	h ′ ″ 23.50.56,5			
Equation of E. A. - -	+ 6,8			
	23.51.03,3	flow, -	-	8′.56″,7
β Caſſiopææ on the meridian, -	8.49.48			
By calculation, -	9.00.01,6	flow, -	-	10.13,6

Therefore the watch loſt 1′.16″,9 in 9 hours, and 205″,06 daily.

N. B.

N.B. The watch had run down on the 5th, and the weather was changing from dry to cloudy, which ended in rain.

For Longitude.

An Emerſion of Jupiter's *firſt Satellite.*

Glaſs ſteady, atmoſphere rather thick.

	h ′ ″
By watch emerged - - - - - -	8.13.35
Too ſlow by the ſtar, - - - - - -	+10.13,6
The ſtar paſſed, after the emerſion 36′; loſs for that time, -	− 5,1
Emerſion, - -	8.23.43,5
Ephemeris, - -	2.47.01,0
Longitude in time, -	5.36.42,5
	° ′ ″
In degrees, - -	84.10.37,5

IECHAPOORE, 1782.

Obſervations by T. D. P.

Double altitudes of *Jupiter*, with the octant and artificial horizon.

Time.		*Angles.*
h ′ ″		° ′ ″
8.10.03	—	64.28.10
13.03	—	63.30.00
15.08	—	62.45.20
18.53	—	61.50.30
8.14.17	Mean,	31.34.15
	Ref.	− 1.34
		31.32.41

Jupiter's R. A. at the time, -	h ′ ″ 17.21.46,6
Declination - -	° ′ ″ 23.02.04S.
☉ R. A. at the time, -	h ′ ″ 11.55.08,2
Latitude by COLEBOOKE, 1784,	ſee Table.
See obſervations at large, -	° ′ ″ 19.06.45

From

From the above data, *Jupiter* had paſſed the meridian $2^h.45'.59'',2$, and the time

		h ′ ″
was		8.12.37,6
	Watch,	8.14.17
	Too faſt,	1.39,4

An Eclipſe of the Moon.

	h ′ ″	
21ſt September,	7.00.15	doubtful.
	01.40	begun certainly.
	02.40	ſtrong ſhadow came on.
	04.14	Penumbra touched a place which I name A.
	09.03	ſhadow touched A.
	9.06.56	ſhadow touched the limb at B.
	08.11	Penumbra going.
	10.12	limb not perfectly bright.
	11.20	end certainly, and at B.

By compariſon of the obſervations at A, it appears that the ſhadow required $4'.49''$ to move through the breadth of the Penumbra. By comparing thoſe at B, it appears that $4'.24''$ were then ſufficient.

The mean of theſe will be very near the truth; it is $4'.37''$

	h ′ ″
Shadow came on,	7.02.40
Advance of Penumbra,	− 04.37
Beginning of eclipſe,	6.58.03
Shadow touched the limb,	9.06.56
Retreat of Penumbra,	+04.37
End of eclipſe,	9.11.33

Duration

		h ′ ″
Duration obſerved,	-	2.13.30
Duration by ephemeris,	-	2.08.30
		+05.00
By ephemeris end,	-	3.28
Beginning,	-	1.19.30
Duration,	-	2.08.30
Ephemeris middle,	-	2.23.45
Middle obſerved by watch,	-	8.04.48
Too faſt,	-	− 1.39,4
		8.03.08,6
Ephemeris,	-	2.23.45
Longitude in time,	-	5.39.23,6
		° ′ ″
In degrees,	-	84.50.54

GANGAM FORT, 1782.

Obſervations by T. D. P. *Latitude determined.*

		h ′ ″
4th September, horizon clear, octant,	-	19.21.30
6th, Very hazy, by ſextant, and quadrant, both agreed,	-	19.21.03
16th, Sextant,	-	19.21.50
Octant,	-	19.19.50
Mean,	-	19.21.03

Theſe were taken from the top of the Chief's houſe, the ſea was the horizon, the height above the area of the fort was meaſured, but the height of that area was gueſſed at; the dip was taken correſponding to this height from the tables.

An

An Obſervation of Jupiter's *fourth Satellite.*

16th September, 1782, immerſion, - - - -	h ′ ″	6.45.27
The change of colour was noted at -		6.44.04

Clouds prevented the obſerving of the emerſion of this, and the immerſion of the firſt which happened that night.

GANJAM CAMP, 1784.

Obſervations by Lieutenant COLEBROOKE.

⊙ On the meridian, November 20th, -	h ′ ″	23,57.36,3		
Equation of E. A. -		+ 05,5		
		23.57.41,8	flow, -	2′.18″,2
⊙ On the meridian, 21ſt, - -	h ′ ″	23.56.00		
Equation of E. A.		+ 05,5		
		23.56.05,5	flow, -	3.54,5
⊙ On the meridian, 22d, - -	h ′ ″	23.54.15,0		
Equation of E. A. -		05,4		
		23.54.20,4	flow, -	5.59,6

* ε *Caſſiopææ*, 24th November.

	Firſt Wire.	*Middle.*	*Upper.*		
	h ′ ″	′ ″	′ ″		h ′ ″
Riſing, -	7.28.20	34.40	42.40		
Falling, -	9.35.53	29.35	21.37		
On the meridian, -	8.32.06,5	32.07,5	32.08,5	=	8.32.07,5
			By calculation, -		8.39.51,2
			Slow, -		7.43,7

Which compared with the laſt ſolar obſervation, gives 91″,3 daily loſs.

An Emerſion of Jupiter's *firſt Satellite.*

		h ,
24th November, by watch emerged,	- - - -	6.37.35
Too ſlow by the ſtar,	-	+ 7.43,7
Loſs after the emerſion, at 91″,3,	-	− 7,3
Emerſion,	-	6.45.11,4
Ephemeris	-	1.04.39
Longitude in time,		5.40.32,4
In degrees,	-	° 86.08.″06

JEHAUDJEPOOR, 1784.

Obſervations by Lieutenant COLEBROOKE.

		Middle.	*Upper.*	
		h , ″	, ″	
17th December, * ε *Caſſiopeæ* riſing,	-	6.31.40	42.03	
falling,	-	8.05.53	55.31	
				h , ″
* On the meridian,	-	7.18.46,5	18.47 =	7.18.46,7
By calculation,	-			7.54.48,7
		h , ″	Watch ſlow,	36.02,0
⊙ On the meridian, 17th,	-	23.23.59,3		
Equation of E. A.	-	+ 1		
		23.24.00	ſlow, -	′ ″ 36.00

An Emerſion of Jupiter's *firſt Satellite.*

		h , ″
By watch emerged,	- - -	6.21.25
Too ſlow by the *	-	36.02
Emerſion,	-	6.57.27
Ephemeris,	-	1.11.50
Longitude in time,	-	5.45.37
In degrees,	-	° , ″ 86.24.15

SOOBUN-

SOOBUNREEKA RIVER CAMP, 1784.

Obſervations by Lieutenant COLEBROOKE.

N.B. Oppoſite Jellaſore, *on the* Ballaſore *ſide of the river.*

⊙ On the meridian, December 24th -	h ′ ″ 23.19.34,1			
Equation of E. A. - -	− ,7			
	23.19.33,4	flow, -	′ ″ 40.26,6	
⊙ On the meridian, December 25th -	h ′ ″ 23.18.12			
Equation of E. A. - -	− 1			
	23.18.11	flow, -	41.49,0	
Daily loſs, - 82″,4				

An Emerſion of Jupiter's *firſt Satellite.*

17th December, by watch emerged, - - - -			h ′ ″ 8.12.42
Full ſplendor.	Too ſlow at the following noon, -		40.26,2
8h.13′.50″	Loſs after emerſion, at 82″,4 -		− 52
	Emerſion, -		8.52.16,2
	Ephemeris, -		3.04,14
	Longitude in time, -		5.48.02,2
	In degrees, -		° ′ ″ 87.00.33,0

An Emerſion of Jupiter's *ſecond Satellite.*

25th December, by watch emerged, - -			h ′ ″ 6.04.40
	Watch ſlow, -		+ 40.26,6
	Loſs till obſervation, at 82″,4 -		+ 23,2
	Emerſion, -		6.45.29,8
	Ephemeris, -		55.57
	Longitude in time, -		5.49.32,8
	In degrees, -		° ′ ″ 87.23.12

A Com-

A Compariſon of the Obſervations for Longitudes, with correſponding Obſervations at different Places, to fix the Longitudes of thoſe which were undetermined.

By T. D. P.

CALCUTTA.

The obſervatory was at the Treaſury Gate in *Fort William.*

Lunar Eclipſes.

		h ′ ″	h ′ ″
1776, July 30th, Immerſion at *Calcutta*,	-	17.01.16	
Greenwich,	-	11.08.21	
			5.52.55

As this was not of the beſt, I reject it.

1779, November 23d. I reject the beginning, becauſe, when compared with *Tycho* in the former part, it appears from a like compariſon of the *Greenwich* obſervations, that it is erroneous a full minute. The firſt *Copernicus* is alſo rejected. And by comparing the end doubtful with *Tycho* and *Copernicus* of the latter part in both ſets, it appears to be the obſervation that muſt be compared with the end at *Greenwich.*

	Calcutta.	*Greenwich.*	*Longitude.*
	h ′ ″	h ′ ″	h ′ ″
The body of Tycho touched,	12.35.30	6.42.29	5.53.01,0
Paſſed,	36.53	43.36	17,0
Immerſion,	13.01.41,3	7.08.08	33,3
Emerſion,	14.40.13,3	8.46.23	50,3
Grimaldi touched,	43.06,3	49.45	21,3
The middle of Copernicus,	15.02.44,1	9.08.59,5	44,6
The body of Tycho touched,	04.56	11.39	17,0
Paſſed,	06.23	12.49	34,0
The end,	15.39.45,6	9.46.09	36,6
		Mean, in time,	5.53.28,3
			° ′ ″
		In degrees,	88.22.04,5

Jupiter's *Satellites.*

From the beginning in 1774, till the 27th December, 1777, the obſervations were made with a middling 18-inch reflector, I allow 24″ to compare it with the large reflector at *Greenwich*, and 12″ for their refractor. The compariſon is of actual correſponding obſervations, except in two caſes, in which the *Calcutta* obſervations are one revolution later. The longitudes of *Paris* and *Stockholm* are taken from WARGENTIN, Phil. Tranſ. vol. 67. LUNDEN, from thirty-three correſponding obſervations found in that ſame paper: of *Chiſlehurſt*, from WOLLASTON, vol. 74. Of *Geneva*, *Oxford*, and *Marſeilles*, from PIGOT, vol. 68 and 76. *Nagpoore* and *Chunargur*, were communicated to me by Lieutenant EWART, of the *Bengal* eſtabliſhment, who obſerved at each place a conſiderable time.

Date.	Place.	Time.	Correction for Longitude or Glaſs.	Times correct.	Longitude. In Time.	In Degrees.
		h ′ ″	h ′ ″	h ′ ″	h ′ ″	° ′ ″
1774, October 14th,	Calcutta,	12.32.25	1ſt Sat. Im. + 24	12.32.49		
	Stockholm,	07.52.00	—1.12.21	6.39.39		
					5.53.10,0	
21ſt.	Greenwich,	° ′ ″	1ſt Sat. Im.	8.35.00		
	Paris,	8.44.47	— 09.25	22		
	Geneva,	8.59.20	— 24.05	15		
	Oxford,	8.30.26	+ 4.59	25		
		Immerſion,	Mean,	8.35.15,5		
			Add one Revolution 1,	18.28.49		
			Day 23d,			
				3.04.45		
23d.	Calcutta,	8.57.15	1ſt Sat. Im. + 24	8.57.39		
					5.53.34,5	
December 31ſt.	Calcutta,	11.25.47	—24 Em.	11.25.23		
	Lunden,	6.25.05	—52.55	5.32.10		
					5.53.13,0	
1776, November 11th.	Greenwich,	1ſt Sat. Im.	N. B. Refractor,	13.37.32		
			Add one Revolution 1,	18.28.06		
			Day, 13th,			
				8.05.38		
13th.	Calcutta,	13.58.56,3	1ſt Sat. Im. + 12	13.59.08,3		
					5.53.30,3	
17th.	Calcutta,	15.31.51,3	3d Sat. Im. + 12	15.32.03,3		
	Chiſlehurſt,	9.38.48,5	—19	9.38.29,5		
					5.53.33,8	
December 18th.	Calcutta,	15.58.21	2d Sat. Im.	15.58.21		
	Marſeilles,	10.25.54	—21.25	10.04.29		
					5.53.52,0	
			Mean by Jupiter's Satellite, -		5.53.29	
			By Lunar Eclipſes, - -		5.53.28	
			Reſult—Longitude of Calcutta, -		5.53.28,5	88.22.07,5

Date.	Place.	Time.	Correction for Longitude or Glaſs.	Times correct.	Longitude. In Time.	In Degrees.
		A Lunar Eclipse.		h ′ ″	h ′ ″	° ′ ″
1782, September 21ſt.	Ichapoore,	The ſhadow touched the limb.		9.05.16,6		
		h ′ ″	h			
	Nagpoore,	8.44.22	—5.18.46	3.25.36		
		Jupiter's Satellites.			5.39.40,6	84.55.09,0
October 9th.	Koſſim Kotta,	1ſt Sat. E.		7.09.48		
	Nagpoore,	6.56.43	—5.18.46	1.37.57		
					5.31.51,0	82.57.45
1784, September 5th.	York,	9.08.54	+ 4.31	9.13.25		
	Greenwich,		Refractor,	15		
			+ glaſs, 13			
	Paris,	9.22.18	— 9.25	06		
			1ſt Sat. E. Mean,	9.13.15,5		
	Beemulwiſſa,	14.47.01,1	— 12	14.46.49,1		
					5.33.34,0	83.23.30,0
				8.23.43,5		
November 8th.	Kalingapatam,		1ſt. Sat. E.	2.47.09		
	Chunargur,	8.19.45	—5.32.26		5.36.34,5	84.08.37,0

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of* 90.	*Refraction or Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1783.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	″
α Aquilæ, E.	Oct. 9th,	4. 3.28,3	4.39.36,2	4.40.00	4,3	4.39.52,4	8.18.24,7N.	12.58.17,1	Viperee.
W.	11th,	6-3.01,5	4.54.39,2	4.55.00	5	4.54.54,2		13.13.18,9	
E.	12th,	4. 3.28	4.39.29,6	4.40.00	4,3	4.39.49,1		12.58.13,8	
α Cygni, W.	9th,	33. 1.20.5	31.19.19,3	31.19.10	35,3	31.19.50	44.30.53,8N.	13.11.03,8	
W.	11th,	33. 1.18,5	31.18.26,5	31.18.30	35,3	31.19.03,6		13.11.50,2	
Fumulhoot, E.	11th,	46. 2.18	43.43.32	43.44.00	54,5	43.44.40,5	30.45.43 S.	12.58.57,5	
α Pegasi, E.	11th,	2-3.12	1. 5.02,4	1. 5.00	1	1. 5.02,2	14. 2.42,8N.	12.57.40,6	
W.	11th,	0. 3.21	0.51.11,3	0.51.30,0	0,8	0.51.21,5		13.11.21,3	
4 Stars, E.								12.58.17,2	Viperee,
4 Stars, W.								13.11.53,5	° ′ ″ 13.05.05,35
Algenib, E.	Nov.	1. 0.00	0.56.15	0.57.00	0,9	0.56.38,4	13.58.34,7N.	13. 1.56,4	Trivatore,
W.	21st.	0. 3.00	0.42.11,3	0.42.30	0,7	0.42.21,3		13.16.13,3	
Pole at 10 P.		79. 3.16	74.53.18	74.53.30	210,0	75.00.12,2	88. 9.08	13.08.55,8	° ′ ″ 13. 9.00,4
				Collim.	+ 428,0				
	1784.								
	April			Below the pole,	228,0				
α Leonis, E.	23d.	0. 1.04	0.15.49,2	0.15.55	0	0.15.55,3	13.00.53 N.	13.16.45	North side of Cortelare river,
α Urs. Maj. W.		52. 3.29	49.39.56	49.40.40	67,0	49.41.25	62.54.43 N.	13.13.18	° ′ ″ 13.15.01,5
α Leonis, W.	25th,	0. 2.09	0.32.05	0.32.40	0,5	0.30.43	13.00.53 N.	13.31.34	Arambaukum,
				Collim.	102				° ′ ″ 13.31.36
α Urs. Maj. W.	26th,	52. 1.29	49.11.48,4	49.12.20	67,0	49.13.11,2	62.54.43 N.	13.41.32.2	Akamapett,
α Virginis, E.		25. 1.01	23.40.45	23.41.00	25	23.41.17,5	10. 1.46 S.	13.39.31.5	° ′ ″ 13.40.32
α Leonis, W.	27th,	0. 3.10,5	0.46.48	0.47.00	0,8	0.46.54,8	13. 0.53 N.	13.47.47.8	Akarumpauk,
γ Leonis, W.		7. 2.14	7. 8.01,6	7. 7.20	7	7. 7.48,8	20.55.38 N.	13.47.50	° ′ ″ 13.47.49
γ Leonis, W	28th,	7. 1.20	6.56.36	6.57. 0	7	6.56.55		13.40.43	Nayrpett,
α Virginis, E.		25.20.01	23.54.49	23.55.00	25	23.55.19	10. 1.46 S.	13.53.33	° ′ ″ 13.56.08
α Urs. Maj. W.	29th,	52. 0.12,5	48.50.29,6	48.50.50	65	48.51.45	62.54.43 N.	14. 2.58	Korwarc,
α Virginis, E.		25. 2.25	24. 5.22	24. 5.50	25	24. 6.01	10. 1.46 S.	14. 4.15	
γ Leonis, W.	30th,	7. 1. 3	6.49.07,2	6.49.10	6,5	6.49.15	20.55.38 N.	14. 6.23	° ′ ″ 14. 5.12,6
α Urs. Maj. W.		52. 0. 9	48.48.57	48.49.40	65	48.50.23	62.54.43 N.	14. 4.20	
α Virginis, E.		25. 2.23	24. 4.29	24. 5.10	25	24. 5.15	10. 1.46 S.	14. 3.29	
α Urs. Maj. W	May	51. 3.04	48.32.42	48.32.00	64	48.33.25	62.54.43 N.	14.21.18	Vincateechil-
α Virginis, E.	1st.	25. 3.26	24.19.52	24.20.00	26	24.20.22	10. 1.46	14.18.36	lum, ° ′ ″ 14.19.57

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
δ Urſ. Maj. W	May	46. 2.17	43.43.06	43.44.00	54	43.44.27	58.13.58 N.	14.29.31	Pinnare River,
ζ Urſ. Maj. W.	3d,	44. 1.10	41.43.27,4	41.33.10	50,3	41.34.09	56. 3.23 N.	14.29 14	North Bank,
								° ′ ″	
α Virginis, E.		26. 0.15	24.29.05,5	24.29.10	26	24.29.33,7	10. 1.46 S.	14.27.47,7	14.28.35
α Virginis, E.	10th,	26. 2.22	25.00.17,6	25.00.40	26,2	25.00.55		14.59.09	Ollore*,
								° ′ ″	
ζ Urſ. Maj. W.		44. 1.20	41.37.51	41.37.20	49	41.38.24,5	56. 3.23 N.	14.24.58,5	14.42.03,8
δ Urſ. Maj. W.	12th,	46. 0.22	43.17.10	43.17.10	53	43.18.03	58.13.58 N.	14.55.55	Mooaumillo-
α Virginis, E.		26. 1.28	24.48.52	24.48.50	25	24.49.16	10. 1.48 S.	14.47.28	dooro,
ζ Urſ. Maj. W.		43. 3.15	41. 7.32	41. 8.10	44	41. 8.35	56. 3.23 N.	14.54.48	
α Virginis, E.	13th,	26. 1.30	24.49.48,5	24.50.00	25	24.50.19,3	10. 1.48 S.	14.48.31,3	° ′ ″
ζ Urſ. Maj. W.		43. 3.14	41. 7.05,5	41. 7.10	44	41. 7.51,7	56. 3.23 N.	14.55.31,3	14.51.42,1
δ Urſ. Maj. W.	19th,	45. 2.07	42.42.27,1	42.42.10	53	42.43.11,5	58.13.58 N.	15.30.46,5	Ongle, properly Wungole,
ε Urſ. Maj. W.		44. 1.17	41.36.32	41.36.00	50	41.37.06	57. 8.02,5 N.	15.30.56,5	
α Virginis, E.		27. 0.22	25.28.25	25.29.00	27	25.29.09,5	10. 1.48 S.	15.27.21,5	° ′ ″
ζ Urſ. Maj. W.		43. 0.27	40.30.37	40.30.30	49	40.31.22,5	56. 3.23 N.	15.32.00,5	15.29.18,2
α Virginis, E.	20th,	27. 1.05	25.35.01	25.35.00	27	25.35.27,5	10. 1.48 S.	15.33.39,5	Chicoortee,
								° ′ ″	
ζ Urſ. Maj. W.		43. 0.17	40.26.13	40.26.05	49	40.26.58	56. 3.23 N.	15.36.25	15.35.44,5
α Virginis, E.	22d,	27. 1.05	25.35.01	25.35.00	27	25.35.27,5	10. 1.48 S.	15.33.39,5	Yenmunbender,
								° ′ ″	
ζ Urſ. Maj. W.		43. 0.13	40.24.29	40.25.00	49	40.25.33,4	56. 3.23 N.	15.37.49,6	15.46.27,5
κ Urſ. Maj. W.	23d,	36. 3.15	34.33.37	34.33.50	39	34.34.22,5	50.23.42 N.	15.49.09	Vantipollam,
								° ′ ″	
α Libræ, E.		32. 3.21	30.51.25	30.51.05	34	30.51.49	15. 8.03 S.	15.43.46	15.46.27,5
α Virginis, E.	25th,	27. 2.15	25.53.28	25.54.00	28	25.54.12	10. 1.48 S.	15.52.24	Baupetla,
								° ′ ″	
ζ Urſ. Maj. W.		42. 3. 3	40. 6.00	40. 5.50	48	40. 6.43	56. 3.23 N.	15.56.40	15.54.32

LIEUTENANT COLEBROOKE had by this time acquired the art of uſing the quadrant, and his obſervations will appear where I did not take any. The next is his, and where his are ſubſtituted, they will be marked C. He did obſerve Chicoortee, the reſult I had entered in my book, it was 15°.34′.10″ but his obſervation was loſt.

κ Urſ. Maj. W.	26th,	36. 2.16	34 20.09,4	34.20.00	39	34.20.43,7	50.23.42 N.	16.02.58,3	Chundole,
								° ′ ″	
α Libræ, E.		33. 0.20	31. 5.02	31. 5.00	34	31. 5.35	15. 8.03 S.	15.57.32	16. 0.15,2 C.
κ Urſ. Maj. W.	28th,	36. 1.22	34. 8.44	35. 8.05	38	34. 9.02,5	50.23.42 N.	16.14.39,5	Sicacollum, on the North Bank of the Kiſtna,
α Libræ, E.		33. 1.15	31.16.54	31.17.00	34	31.17.31	15. 8.03 S.	16. 9.28	° ′ ″ 16.12.04,3

* The quadrant was pulled to pieces at Pinnare Camp, and the line of collimation had not been adjuſted; it was performed before it was next uſed.

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	ARCH OF 96. *Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	′ ″	° ′ ″	° ′ ″	° ′ ″	
ε Urſ. Maj. W.	May	43. 1.18	40.40.43	40.39.55	49	40.41.08	57. 8.02,5 N.	16.26.54,5	Moodenoore,
	29th,								° ′ ″
α Virginis, E.		28. 0.21	26.24.14	26.23.30	29	26.24.21	10. 1.48 S.	16.22.33	16.24.38,8 C.
α Virginis, E.	June	28. 1.28	26.41.22	26.42.00	29	26.42.10		16.40.22	Ellore,
ζ Urſ. Maj. W.	1ſt.	41. 3.22	39.18.16	39.18.10	48	39.19.10	56. 3.25 N.	16.44.13	16.42.17,5 P.
ε Urſ. Maj. W.		43. 0.08	40.22.15,9	40.22.20	49	40.23.07	57. 8.02,5 N.	16.44.55,5	
η Urſ. Maj. W.		35. 3.17	33.38.24,5	33.38.40	37,7	33.39.10	50.23.42 N.	16.44.32	° ′ ″
α Libræ, E.		33. 3.22	31.48.06,3	31.48.10	35	31.48.43,2	15. 8.04 S.	16.40.39,2	16.42.41,5 C.
⊙ Up. L. W.	4th,	5. 2.20	5.18.10	5.18.40	5,0	5.34.18	22.32.32 N.	16.58.14 P.	Soolaurum,
				Semidia.	+ 15.49				
				Parallax,	1,0				° ′ ″
α Virginis, E.		28. 2.28	26.55.26	26.55.20	29	26.55.52	10. 1.48 S.	16.54.04 C.	16.56.08,5
α Virginis, E.	12th,	28. 3.02	26.58.04	26.57.05	29	26.58.03,5		16.56.15,5	Rajahmundree,
ζ Urſ. Maj. W.		41. 2.15,5	39. 1.11,2	39. 1.20	46	39. 2.01,6	56. 3.23 N.	17. 1.12,4	° ′ ″ 16.58.43,6 P.
κ Urſ. Maj. W.	12th,	35. 2.09	33.20.50	33.21.00	36	33.21.31	50.23.42 N.	17. 2.11	
α Libræ, E.		34. 0.23	32. 2.44	32. 2.40	35	32. 3.17	15. 8.04 S.	16.55.13	16.58.42 C.
κ Urſ. Maj. W.	13th,	35. 1.29	33.15.33	33.15.00	35,5	33.15.52	50.23.42 N.	17. 7.50	Rajahnagur,
									° ′ ″
β Libræ, E.		27. 1.07	25.35.53	25.35.00	27	25.35.53	8.34.33 S.	17. 1.20	7. 4.35 C.
κ Urſ. Maj. W.	14th,	35. 1.29	33.15.33,5	33.15.55	37	33.16.21	50.23.42 N.	17. 7.21	Peddapore,
α Draconis, W.		51. 2.00	48.16.52,5	48.16.10	62,7	48.17.34	65.24.36 N.	17. 7.02	
α Libræ, E.		34. 1.18	32.10.05	32. 9.30	34,5	32.10.22	15. 8.04 S.	17. 2.18	° ′ ″
β Libræ, E.		27. 1.07	25.35.53,3	25.34.40	25,4	25.36.12	8.34.33 S.	17. 1.39	17. 4.35 P.
β Scorpii, E.	18th,	38. 2.20	36.14.25	36.13.40	41,5	36.14.44	19.12.01,6 S.	17. 2.42	
γ Draconis, W.		36. 2.24	34.23.40	34.24.00	39,0	34.24.29	51.31.18 N.	17. 6.49	17. 4.45,5 C.
α Virginis, E.	20th,	28. 3.27	27. 8.59,7	27. 8.30	29,0	27. 9.13,7	10. 1.48 S.	17. 7.26	Gooloopool-
β Libræ, E.		27. 1.19	25.41.09,7	25.41.30	28,0	25.41.48	8.34.33 S.	17. 7.15	loore,
ζ Urſ. Maj. W.		41. 1.30	38.53.30	38.53.20	44,0	38.54.09	56. 3.33 N.	17. 9.05	° ′ ″
κ Urſ. Maj. W.		35. 1.23	33.12.55,2	33.12.50	37	33.13.15	50.23.42 N.	17.10.27	17. 8.33,5 C.
κ Urſ. Maj. W.	21ſt.	35. 1.16	33. 9.50,6	33. 9.20	37	33.10.12	50.23.42 N.	17.13.30	Tonding and Matoor,
α Libræ, E.		34. 1.39	32.19.18	32.20.00	35	32.20.14	58.18.04 S.	17.12.10	° ′ ″ 17.12.45 C.
β Libræ, E.	22d,	27. 2.10	25.51.16	25.50.20	28	25.53.06	8.34.33 S.	17.18.33	Suteawaurum,
					+ 1.50				° ′ ″
		From 18th to 20th June							17.18.33 C.
α Coronæ Borealis, W.	24th,	10. 2.02	9.51.30	9.50.40	10	9.51.15	27.27.03,5 N.	17.35.48,5	Ellmuchillee,
β Scorpii, E.		39. 0.19	36.42.06	36.41.50	43	36.42.41	19.12.01,6 S.	17.30.39,4	° ′ ″ 17.33.14 C.

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the Observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
α Coronæ Borealis, W.	June 27th,	10. 1.08 *	9.40.04,7	9.39.40	9,6	9.40.02	27.27.03,5N.	17.47.01,5	Sobaurum,
β Scorpii, E.	July 9th,	39. 1.23,5	36.58.08,4	36.57.20	43	36.58.27,2	19.12.02 S.	17.46.25,2	° ′ ″ 17.46.59,2 C.
α Scorpii, E.	12th,	46. 2.11	43.40.27,6	43.41.00	55	43.41.39	25.56.12 S.	17.45.27	These were made with difficulty amongst clouds and winds, but they were all that could be had.
⊙ Up. L. W.		5.04.12	3.50.16,4	3.50.00 Ref.& Par. Semedia.	3,6 + 15.47	4. 5.59	27.55.02 N.	17.49.03	
α Lyræ, W.	Sept.	22.00.29	20.50.14	20.49.40	33	20.50.30	38.35.26,3N.	17.44.56,3	Vizacpatam,
β Lyræ, W.	8th,	16.01.20	15.22.51	15.22.10	15	15.22.45,5	33.07.16 N.	17.44.30,5	
α Aquilæ, E.		9.03.27	9.20.18,2	9.20.00	9	9.20.18,1	8.18.32,5N.	17.38.50,6	° ′ ″
β Aquilæ, E.		12.02.05,5	11.45.33	11.45.10	12	11.45.34	5.53.08,3N.	17.38.42,3	17.41.45
α Coronæ Borealis, W.	July 14th,	10. 0.16	9.29.32	9.28.50	9,5	9.29.20,5	27.27.03,5N.	17.57.43,5	Beemulwilsa Camp. A clear night,
γ Draconis, W.		35. 3.07	33.34.01	33.33.10	37,5	33.34.13	51.31.18 N.	17.57.05	° ′ ″
α Scorpii, E.		39. 2,03	37. 3.11	37. 2.40	43	37. 3.38,5	19.12.02 S.	17.51.36,5	17.54.15 C.
β Scorpii, E.		46. 2.23	43.45.44	43.46.00	55	43.46.47	25.56.12 S.	17.50.35	Simachillum,
β Libræ, E.		28. 0.03	26.18.31	26.19.00	20,5	26.19.14	8.34.33 S.	17.44.41	
α Coronæ Borealis, W.	8th,	10. 1.05,5	9.38.59	9.38.40	9,5	9.38.59,0	27.27.03,5N.	17.48.04,5	° ′ ″ 17.46.28,8 C.

The four following Obſervations were taken by a quadrant made by RAMSDEN, eighteen inches radius, which ſhewed Altitudes.

α Lyræ, W.	Aug.	73. 3.10	69.17.13,6	69.17.35	—22	69.17.02,3	38.35.26,1N.	17.52.28,4	Beemulwilsa,
β Lyræ, W.	29th,	79.03.00,9	74.45.47,3	74.46. 0	—15,6	74.45.38	33.07.16 N.	17.52.54,0	Head Quarters,
α Aquilæ*, E.		85.03. 2	80.24.24	80.24.50	—10	80.24.27	8.18.32 N.	17.54. 5	° ′ ″
β Aquilæ†, E.		83.00.12	77.58.32	77.58.47	—12	77.58.28	5.53.08 N.	17.54.40	17.53.32 P.
α Draconis, W.	8th,	35.03.11	33.35.46,3	33.35.00	38	33.36.01	51.31.18 N.	17.55.17	
α Lyræ, W.		22.00.04	20.39.16	20.38.30	20	20.39.13	38.35.26 N.	17.56.13	
α Lyræ, W.	9th,	22.00.05	20.39.42	20.39.00	20	29.39.41		17.55.45	
ε Sagittarii, E.		55.03.08	52.19.27,3	52.18.50	75	52.20.18,6	34.27.59,5 S.	17.52.29	
α Aquilæ, E.	28th,	10.00.23,5	9.32.50	9.33.00	10	9.33.05	8.18.32,5N.	17.51.37,5	
ε Sagittarii, E.	31ſt,	55.03.07	52.19.01	52.18.40	75	52.20.06	34.27.59,5 S.	17.52.06,5	
α Lyræ, W.		22.00.06	20.40.09	20.39.30	20	20.40.15	38.35.26 N.	17.55.11	
α Cygni, W.	Sept.	28.01.13	26.34.46,6	26.35.00	29	26.35.22	44.31.05,3N.	17.55.43,3	
β Aquarii, E.	3d,	25.03.30	24.21.37,3	24.22.00	25	24.22.14	6.30.33 S.	17.51.41	
ω Cephei, W.	27th,	46.02.22	43.45.17,3	43.45.00	55	43.46.04	61.40.42 N.	17.54.38	
β Aquarii, E.		26.00.00	24.20.30	24.22.20	25	24.22.50	6.30.33 S.	17.52.17	
6 North Stars,								17.55.28	
6 South Stars,								17.52.14	

Head Quarters, Cantonments at Beemulwilsa, ° ′ ″ 17.53.51 C.

The Mean, - 17.53.51 C.

* From the reading of α Aquilæ, 29th Auguſt, ſubtract 48″, † and from β Aquilæ 45″

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

From henceforward all the Obſervations were taken by Lieutenant COLEBROOKE.

Phænomenon and Face of the Quadrant.	*Date*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Diſtance corrected.*	*Declination.*	*Latitude by the Obſervation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
α Cephei, W	Oct.	46.01.24	43.32.06,8	43.31.30	53	43.32.42.3	61.40.42,2N.	18.08.00	Vizianagur Palace,
β Aquarii, E	22d,	26.00.26	24.33.55,6	24.33.30	26	24.34.08.8	6.30.33 S.	18.03.35,8	
α Cygni, W.	23d,	28.00.15,8	26.21.35,5	26.22.00	28	26.22.15.8	44.31.05,3N.	18.08.49,6	
α Cephei, W.		46.01.25	43.32.32,9	43.31.46	54	43.33.03.5	61.40.42,2N.	18.07.38,7	° ′ ″
β Aquarii, E.		26.00.26	24.33.55,6	24.33.35	26	24.34.11.3	6.30.33 S.	18.03.38,3	18.05.52,3
α Cygni, W.	25th,	28.00.27	26.26.51,9	26.27.00	28	26.26.24	44.31.05,2N.	18.03.41,2	Brimſing,
α Cephei W.		46.02,00	43.36.30,2	43.35.50	54	43.37.04.1	61.40.42,2N.	18.03.38,1	
β Aquarii, E.		26.00.19	24.30.51	24.30.00	26	24.30.51.5	6.30.33 S.	18.00.18,0	° ′ ″ 18.01.59
7 Lacertæ,W.	26th,	33.01.23	31.20.25,2	31.20.00	34,4	31.20.47	49.10.48 N.	17.50.01	Santipollum,
Fumulhoot,E.		51.03.07	48.34.00,8	48.33.30	64	48.34.49.5	30.45.25,6 S.	17.49.23,8	° ′ ″ 17.49.42,4
α Cephei, W.	31ſt,	46.02.00	43.35.37,5	43.35.00	54	43.36.13	61.40.42,2N.	18.05.29,2	Chintulwilſa,
β Aquarii, E.		26.00.18	24.30.24,6	24.30.00	25,7	24.30.38	6.30.33 S.	18.00.05	° ′ ″ 18.02.17,1
α Cephei, W.	Nov.	46.01.26	43.32.59,3	43.32.50	54	43.33.48.6	61.40.42,2N.	18.06.53,6	Narrainpoore,
β Aquarii, E.	1ſt.	26.00.23	24.32.36,5	24.32.20	26	24.32.54.3	6.30.33 S.	18.02.21,3	
Fumulhoot,E.		52.00.08	48.48.30,9	48.48.30	65	48.49.35.5	30.45.25,6 S.	18.04.08,9	
β Caſſiopææ, W.		42.01.29	39.49.18,4	39.49.00	48	39.49.57.2	57.57.50 N.	18.07.52,8	° ′ ″ 18.05.18,7
α Aquarii, E.	3d,	20.02.26	19.24.33,5	19.24.00	20	19.24.36.8	1.21.30,6 S.	18.03.06.2	Kundawilſa,
7 Lacertæ,W.		33.00,11	31.01.05,1	31.01.30	34	31.01.51.6	49.10.48 N.	18.08.56,4	° ′ ″ 18.06.01,3
α Aquarii, E.	4th,	20.03.10	19.31.34,9	19.31.30	20	19.31.52.5	1.21.30,6 S.	18.10.21.9	Timorgudha,
7 Lacertæ,W.		33.00.00	30.56.15	30.55.20	34	30.56.21.5	49.10.48 N.	18.14.26.5	° ′ ″ 18.12.24,2
α Andromedis, W.	5th,	10.00.27	9.34.22	9.34.20	10	9.34.31	27.53.56 N.	18.19.25	Sicacole Camp,
γ Pegaſi, E.		4.02.06	4.15.45,7	4.15.00	4	4.15.27	13.59.10 N.	18.14.37	° ′ ″ 18.17.01
α Cephei, W.	7th,	46.00.21	43.16.43,7	43.17.00	53	43.17.45	61.40.42,2N.	18.22.57,2	Kalingapatam Camp,
Fumulhoot, E.		52.01.11	49.03.54	49.04.09	65	49.05.02	30.45.25,6 S.	18.19.36.4	° ′ ″ 18.21.16,8
Fumulhoot,E.	9th,	52.01.28	49.11.22,1	49.11.20	64	49.12.25		18.26.59.4	Kulliparoo,
α Andromedis, W.		10.00.02	9.23.22,4	9.23.30	10	9.23.36	27.53.53 N.	18.30.17	° ′ ″
γ Pegaſi, E.		4.03.02	4.28.04	4.27.30	5	4.27.52	13.59.07 N.	18.26.59	18.28.39
α Andromedis, W	11th,	9.02.27	9.06.14,5	9.05.40	10	9.06.07	27.53.53 N.	18.47.46	Coſſeboogaum, ° ′ ″
γ Pegaſi, E.		5.00.05	4.43.27	4.43. 0	4,5	4.43.18	13.59.07,5N.	18.42.25.5	18.45.05,8
Fumulhoot,E.	14th,	53.00.10	49.45.38.7	49.45.30	67	49.46.41.4	30.45.22,5 S.	19.01.19	Kutwaul Talanb, ° ′ ″
β Caſſiopææ, W.		41.01.28	38.52.37.1	38.52.00	56	38.53.04.6	57.57.46,7N.	19.04.42.1	19.03.00,5

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phœnomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
α Andromedis,	Nov.								Ichapoor,
W.	15th,	9.01.10	8.44.42,5	8.45.00	8,7	8.45.00	27.53.59 N.	19.08.59	° ′ ″
γ Pegasi, E.		5.01.23	5.05.25,3	5.05.00	5	5.05.17,5	13.59.13,3 N.	19.04.30,8	19.06.45
7 Lacertæ, W.	16th,	31.03.10	29.50.20	29.49.40	33	29.50.33	49.10.45 N.	19.20.12	Surrampoore,
									° ′ ″
Fumulhoot, E.		53.01.15	50.01.54,3	50.02.00	67	50.03.04,2	30.45.22,5 S.	19.17.41,	19.18.57
7 Lacertæ, W.	17th,	31.03.13	29.51.39,1	29.51.00	33	29.51.52.6	49.10.45 N.	19.18.52,4	Munsoor Cottah,
									° ′ ″
Fumulhoot, E.		53.01.10	49.59.40,4	49.59.30	67	50.00.42.2	30.45.22,5 S.	19.15.19,7	19.17.05,5
E.	18th	53.01.24	50.05.51,6	50.05.30	67	50.06.48		19.21.25,5	Ganjam Camp,
β Cassiopææ,									° ′ ″
W.		41.00.13	38.31.58	38.31.00	46	38.32.15	57.57.53 N.	19.25.38	19.23.32
Fumulhoot, E.	25th,	53.02.06	50.12.00,7	50.12.00	67	50.13.07,5	30.45.22,5 S.	19.27.45	Viaghee,
β Cassiopææ,									° ′ ″
W.		41.00.03	38.27.34,7	38.26.50	45,6	38.27.58	57.57.50,0 N.	19.29.55	19.28.50
Fumulhoot, E.	26th,	43.02.14	50.15.31,7	50.15.30	67	50.16.38	30.45.22.5 S.	19.31.15,5	Maloodee,
β Cassiopææ,									° ′ ″
W.		40.03.25	38.23.11	38.23.10	45,6	38.23.56,1	57.57.53 N.	19.33.57	19.32.36,5
Fumulhoot, E.	29th,	53.03.04	50.25.11,8	50.24.40	67	50.26.02	30.45.22.5 S.	19.40.40,5	Manickpatam,
α Andromedis,									
W.		8.02.29	8.10.52,2	8.10.50	8	8.10.59,1	27.53.59.0 N.	19.43.00	
α Cassiopææ,									° ′ ″
W.		38.00.01	35.37.56,4	35.37.30	40,8	35.38.24	55.21.23.0	19.42.59	19.41.50
Fumulhoot, E.	Dec.	53.03.21	50.32.40.	50.32.30	67	50.32.42	30.45.22.5 S.	19.48.19,5	Jaggernaut,
γ Pegasi, E.	4th,	6.00.21	5.46.43,7	5.46.30	6	5.46.43	13.59.13.3 S.	19.45.56,3	
α Cassiopææ,									
W.		37.03.22	35.33.06,3	35.32.40	41	35.33.34,2	55.21.23 N.	19.47.49	
α Andromedis,									° ′ ″
W.		8.02.12	8.03.26	8.03.00	8	8.03.21	27.53.59 N.	19.50.38	19.41.50
α Andromedis,									
W.	7th,	8.01.21	7.53.17,5	7.53.20	8	7.53.27	27.53.59 N.	20.00.32	Ahmetpoore,
α Cassiopææ,									
W.		37.02.26	35.20.48	35.21.00	40	35.21.34	55.21.23 N.	19.59.49	
ε Cassiopææ,									
W.		45.01.24	42.35.52	42.36.00	52	42.36.44	62.36.07 N.	19.59.23	
γ Pegasi, E.		6.01.06	5.54.12	5.54.00	6	5.54.12	13.59.13.3 N.	19.53.25,3	
η Ceti, E.		33.01.05	31.12.30,7	31.12.00	34	31.12.49,4	11.19.35 S.	19.53.14,4	° ′ ″
θ Ceti, E.		31.00.17	29.11.13,3	29.10.30	32	29.11.23.6	9.17.47 S.	19.53.36,6	19.56.40,2
α Cassiopææ,									
W.		37.02.05	35.11.34,3	35.11.00	40	35.11.57	55.21.23 N.	20.09.26	Peeply,
δ Cassiopææ,									
W.	8th,	41.02.07	38.57.27,1	38.57.00	46	38.57.59,6	59.06.56 N.	20.08.56	° ′ ″
η Ceti, E.		33.02.00	31.24.22,6	31.24.00	34,4	31.24.46	11.19.35 S.	20.05.11	20.07.11
α Andromedis,									
W.	9th.	8.00.08	7.33.31	7.33.00	7,5	7.33.23	27.53.59 N.	20.20.36	Ballunta,
									° ′ ″
γ Pegasi, E.		6.02.22	6.15.18	6.15.30	6	6.15.30	13.59.13 N.	20.14.43	20.17.40

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	ARCH OF 96. *Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	Sowlagunda,
γ Caſſiopeæ,	Dec.								near Kuttack,
W.	10th,	41.02.22	39.04.02,6	39.03.30	46	39.04.30	59.52.54 N.	20.28.21,7	° ′ ″
η Ceti, E.		33.03.13	31.43.59	31.43.30	35	31.44.20	11.19.35 S.	20.24.45	20.26.33,5
ε Caſſiopeæ,									
W.	15th,	44.02.16	41.50.09,4	41.49.40	51	41.50.45,7	62.36.07 N.	20.45.21,3	Koomereah River, north ſide,
									° ′ ″
ω Piſcium, E.		20.00.29	18.57.44,7	18.57.40	19	18.58.01,4	1.43.03 N.	20.41.04,4	20.43.13
α Caſſiopeæ,									Jehaujepoore
W.	17th.	36.02.20	34.26.18,5	34.26.00	39	34.26.48,3	55.21.23 N.	20.54.34,7	River, north
η Ceti, E.		34.01.04	32.18.19,3	38.08.20	35	32.08.55	11.19.35 S.	20.49.20	ſide, ° ′ ″
γ Caſſiopeæ,									20.51.57
W.	19th,	41.00.15	38.32.50,5	38.32.30	45	38.33.25,3	59.32.54 N.	20.59.28,7	Chorakootee,
δ Caſſiopeæ,									
W.		40.02.18	38.06.02,1	38.05.30	44	38.06.30	59.06.56 N.	21.00.26	° ′ ″
θ Ceti, E.		32.01.04	30.15.49,3	30.15.20	33,3	30.16.08	9.17.47 S.	20.58.21	20.59.09
β Caſſiopeæ,									Raneeka Tau-
W.	20th,	44.00.29	31.27.44,7	41.27.30	50	41.28.27,4	62.36.07 N.	21.07.40,4	laub, ° ′ ″
δ Ceti, E.		23.00.29	21.42.06	21.42.00	22	21.42.25	0.36.32 S.	21.05.53	21.06.46
α Caſſiopeæ,									
W.	21ſt.	36.01.15	34.05.39,3	34.05.20	38	34.06.08	55.21.23 N.	21.15.15	Kaunſe Baunſe,
δ Caſſiopeæ,									
W.		40.01.16	37.51.05,7	37.51.00	44	37.51.47	59.06.56 N.	21.15.09	
η Ceti, E.		34.02.24	32.31.10,3	02.30.40	36	32.31.31,2	11.19.35 S.	21.11.56,2	° ′ ″
θ Ceti, E.		32.02.06	30.30.45,7	30.30.20	33	30.31.06	9.17.47 S.	21.13.19	21.13.52,3
α Caſſiopeæ,									Aumnulla,
W.	22d,	36.00.24	33.55.33	33.55.30	38	33.56 09,5	55.21.23 N.	21.25.13,5	° ′ ″
η Ceti, E.		34.03.12	32.39.57,3	32.39.40	35,4	32.40.24	11.19.35 S.	21.20.49,0	21.23.01,2
ε Caſſiopeæ,									
W.	23d,	43.02.24	40.57.05,4	40.57.00	49,3	40.57.52	62.36.07 N.	21.38.14,3	Daumdurpoor,
γ Andromedis,									
W.		20.03.25	19.38.10,5	19.37.40	21,8	19.38.17	41.17.22 N.	21.39. 5,0	
ω Piſcium, E.		21.00.24	19.51.48	19.51.00	21	19.51.45	1.43.03 N.	21.34.48,0	° ′ ″
δ Ceti, E.		23.02.18	22.09.47,2	22.10.00	22,4	22.10.16	0.36.32,0 S.	21.33.44,0	21.36.38
ε Caſſiopeæ,									Soobanreeka
W.	24th,	43.02.06	40.49.10,8	40.49.00	49	40.49.54,4	62.36.07 N.	21.46.12,6	River, at Rauje
δ Ceti, E		23.03.09	22.19.54	22.19.30	22	22.20.04	0.36.32 S.	21.43.32,0	Gaut, on the
ε Caſſiopeæ,									Ballaſore ſide,
W.	26th,	43.01.30	40.46.10	40.46.00	49	40.46.54	62.36.07 N.	21.49.13,0	° ′ ″
ε Eridani, E.		34.00.06	31.55.08	31.55.08	35	31.55.43	10.13.26,6 S.	21.42.16,4	21.45.18,5
δ Caſſiopeæ,									Jellaſore Camp.
W.	27th,	39.03.02	37.16.49	37.16.00	48	37.17.13	59.06.56 N.	21.49.43	° ′ ″
δ Ceti, E.		23.03.10	22.20.20	22.20.00	24	22.20.34	0.36.32 S.	21.44.02	21.46.53
η Ceti, E.	28th,	35.01.27	33.14.40,6	33.14.00	38	33.14.58,3	11.19.35 S.	21.55.23,3	Dantoon Camp.
δ Caſſiopeæ,									° ′ ″
W.		39.02.11	37.06.32,5	37.06.00	43	37.06.59,3	59.06.56 N.	21.59.56,7	21.57.40

OBSERVATIONS *at large for determining the Latitude of* PLACES.

Phænomenon and Face of the Quadrant.	*Date,*	ARCH OF 96. *Reading.*	*Value.*	*Arc b 090*	*Equation applied.*	*Zenith Distance Corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place & its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
γ Cassiopææ, W.	Dec. 29th,	39.03.21	37.25.10.	37.24.40	42	37.25.37	59.32.55,5 N.	22.07.18	Khutnagur,
η Ceti, E.		35.02.06	33.19.30,6	33,19.10	37	33.19.57,3	11.19.35 S.	22.00.22	° ′ ″ 22.03.50
γ Cassiopææ, W.	30th.	39.03.02	37.16.49	37.16.30	42	37.17.22	59.32.55,5 N.	22.15.33,5	Mokurrumpoor,
δ Cassiopææ, W.		39.01.08	36.51.19.7	36.50.40	43	36.51.43	59.06.56 N.	22.15.13	° ′ ″
η Ceti, E.		35.02.27,5	33.28.57,5	33.28.20	37	33.29.16	11.19.35 S.	22.09.41	22.12.32,1
γ Perſei, W.	31ſt,	32.00.29	30.12.44,7	30.13.00	33	30.13.25,4	52.37.59 N.	22.24.33,6	Kaffai River,
β Perſei, W.		18.03.14	17.40.50,4	17.40.30	18	17.40.58,2	40.06.50 N.	22.25.51,8	
δ Ceti, E.		24.01.26	22.55.29,3	22.55.00	24	22.55.39	00.36.32 S.	22.19.07	° ′ ″
12 Eridani, E.		55.02.16	52.08.54,5	52.09 10	73	52.10.15,3	29.51.02 S	22.19.13,3	22.22.11,3
δ Cassiopææ, W.	Jan. 4th,	39.00.10	36.38.08,7	36 37.40	42	36.38.36.3	59.06.56 N.	22.28.19,7	Midnapoor Fort,
ε Cassiopææ, W.		42.03.07	40.07.46	40.07.30	48	40.08.26	62.36.07 N.	22.27.41	° ′ ″
δ Ceti, E.		24.02.00	22.58.07,5	22.58.00	24	22.58.48	00.36.32 S.	22.22.16	22.25.08,3
ε Cassiopææ, W.	5th,	42.03.05	40.06.53	40.06.00	48	40.07.15	62 36.07 N.	22.28.52	Bunpoor,
δ Ceti, E		24 02.06	23.00.46	23.00.30	24	23.01.02	00.36.32 S.	22.24.30	° ′ ″ 22.26.41
δ Cassiopææ, W.	6th,	38.03.12	36.24.57,7	36.25.00	43	36.25.42	59.06.56 N.	22.41.14	Narraindeo-wul,
12 Eridani, E.		55.03.22	52.25.36,4	52.25 30	75	52.26.48,2	29.51.02 S.	22.35.46,2	° ′ ″ 22.38.30
γ Perſei, W.	7th,	31.03.09	29.49.53,6	29.49.20.	33	29.50.10	52.37.59 N.	22.47.49	Madapoor,
12 Eridani, E.		56.00.10	52 34.24	55.34.40	74	52.35.46	29.51.02 S.	22.44.44	° ′ ″ 22.46.16,5
γ Perſei, W.	8th,	31.03.05	29.48.03	29.47.50	33	29 48.32	52.37.59 N	22.49.27	Chunderbund,
12 Eridani, E.		56.00.09	52.34.11	52.34.00	74	52.35.20	29.51.02 S.	22.44.18	° ′ ″ 22.46 52,5
γ Perſei, W.	10th,	32.00.03	30.01.19	39 01.00	33	30.01.42,5	52.37.39 N.	22.36.16,5	Habra Gaut,
12 Eridani, E.		55.03.14	52.22.05,4	52.22.10	74	52.33.21,7	29.51.02 S	22.32.19,7	° ′ ″ 22.34.18,1

MR. BURROWS publiſhed, in the Lady's Diary, a Theorem ſimilar to mine, page 17: he ſhewed it to me laſt year: my original Book of Obſervations convinced him, that his publication could not have been known to me when I wrote the Theorem.

III.

A ROYAL GRANT OF LAND, ENGRAVED ON A COPPER PLATE, BEARING DATE TWENTY-THREE YEARS BEFORE CHRIST; AND DISCOVERED AMONG THE RUINS AT MONGUEER.

Tranſlated from the Original SANSCRIT, *by* CHARLES WILKINS, *Eſq. in the Year* 1781.

DEB PAUL DEB *.

PROSPERITY!

HIS wiſhes are accompliſhed. His heart is ſteadfaſt in the cauſe of others. He walks in the paths of virtue. May the achievements of this fortunate Prince cauſe innumerable bleſſings to his People!

By diſplaying the ſtrength of his genius, he hath diſcovered the road to all human acquirements; for being a *Soogot* (1), he is Lord of the Univerſe.

Gopaal, King of the World, poſſeſſed matchleſs good Fortune: he was Lord of two Brides; the Earth and her Wealth. By compariſon of the learned he was likened unto *Preetoo* (2), *Sogor* (3), and others, and it is credited.

When his innumerable army marched, the heavens were ſo filled with the duſt of their feet, that the birds of the air could reſt upon it.

He acted according to what is written in the *Shaſtra* (4), and obliged the different ſects to conform to their proper tenets. He was bleſſed with a ſon, *Dhorma Paal*, when he became independent of his forefathers, who are in heaven.

His elephants moved like walking mountains, and the earth, oppreſſed by their weight and mouldered into duſt, found refuge in the peaceful heavens.

* In this tranſlation the *Sanſcrit* names are written, as they are pronounced in *Bengal*; but, in the following paper, the tranſlator has adopted the more elegant pronunciation of *Várânes* and *Caſ'hmir*.

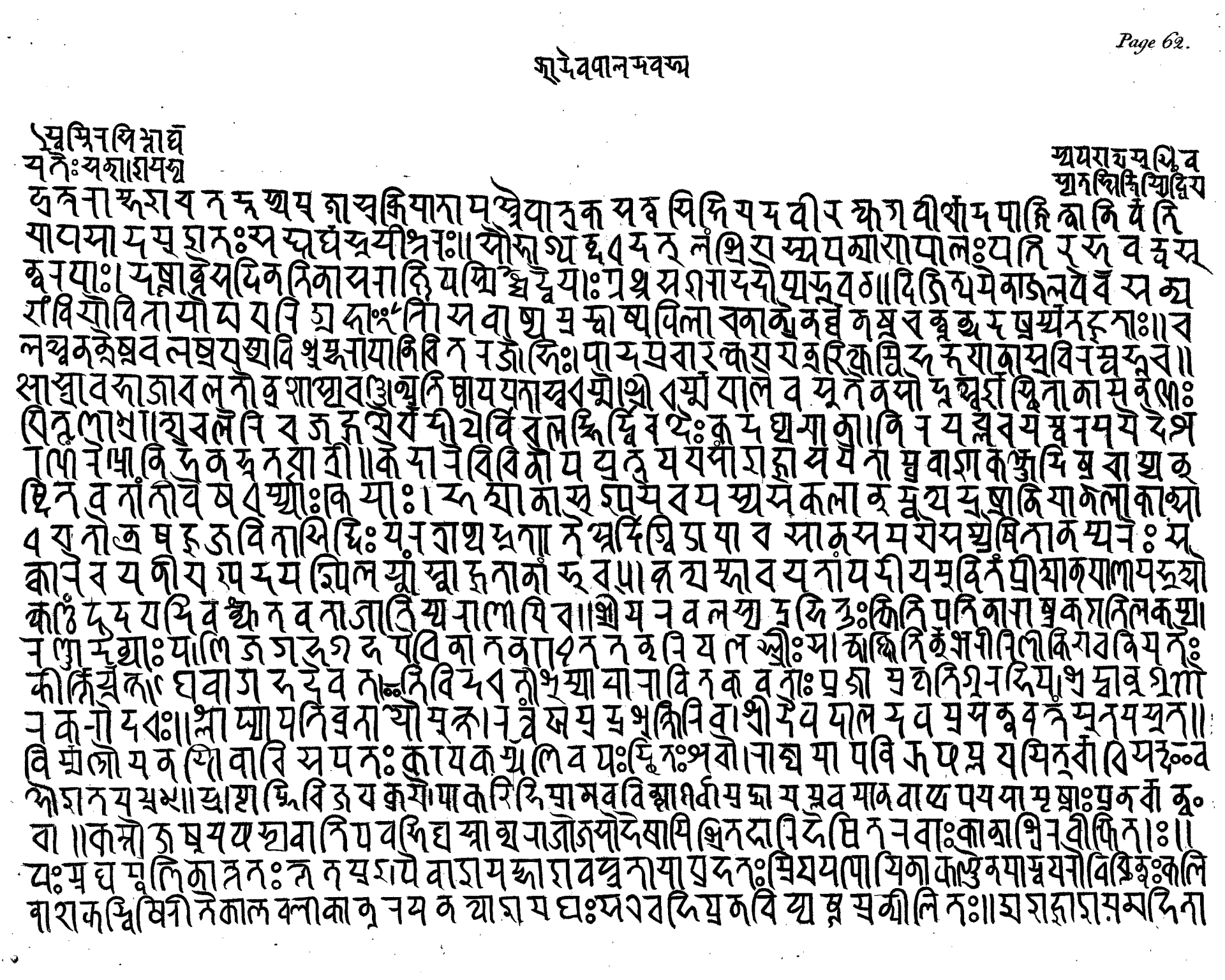
(1) *Soogot*—ſignifies an Atheiſt, or follower of the tenets of *Soogot*, a Philoſopher, who is ſaid to have flouriſhed at a place called *Keekot* in the province of *Behar*, one thouſand years after the commencement of the *Kolee Joog*, or *Iron Age*; of which this is the 4882d Year. He believed in viſible things only, or ſuch as may be deduced from effects the cauſe of which is known: as from ſmoke the exiſtence of fire. He wrote many books to prove the abſurdity of the religion of the *Brahmons*; and ſome upon Aſtronomy and other ſciences, all which are ſaid to be now in being. He further held that all our actions are attended by their own rewards and puniſhments in this life; and that all animals having an equal right to exiſtence with Man, they ſhould not be killed either for ſport or food.

(2) *Preetoo*—was the ſon of *Beno*, and *Raajaa* of a place called *Beetoor* near *Lucknow*. He flouriſhed in the firſt Age of the World, and is ſaid to have levelled the earth, and, having prepared it for cultivation, obliged the people to live in ſociety.

(3) *Sogor*—the name of a Raajaa who lived in the ſecond Age at *Ojoodho*, and is ſaid to have dug the rivers.

(4) *Shaaſtra*—book of divine ordinations: The word is derived from a root ſignifying to command.

He



He went to extirpate the wicked and plant the good, and happily his ſalvation was effected at the ſame time: for his ſervants viſited *Kedaar* (1), and drank milk according to the law; and they offered up their vows, where the Ganges joins the ocean, and at *Gokornaa* (2), and other places (3).

When he had completed his conqueſts, he releaſed all the rebellious Princes he had made captive, and each returned to his own country laden with preſents, reflected upon this generous deed, and longed to ſee him again; as mortals, remembering a pre-exiſtence, wiſh to return to the realms of light.

This Prince took the hand of the daughter of *Porobol*, Raajaa of many countries, whoſe name was *Ronnaa Debee*; and he became ſettled.

The people, being amazed at her beauty, formed different opinions of her: ſome ſaid it was *Lockee* (4) herſelf in her ſhape; others that the earth had aſſumed her form; many ſaid it was the Raajaa's fame and reputation; and others that a houſehold goddeſs had entered his palace. And her wiſdom and virtue ſet her above all the ladies of the court.

This virtuous and praiſe-worthy Princeſs bore a ſon *Deb Paal Deb*, as the ſhell of the ocean produces the pearl:——

In whoſe heart there is no impurity; of few words, and gentle manners: and who peaceably inherited the kingdom of his father, as *Bodheeſotwo* (5) ſucceeded *Soogot*.

He, who marching through many countries making conqueſts, arrived with his elephants in the foreſts of the mountains of *Beendhyo* (6), where ſeeing again their long-loſt families, they mixed their mutual tears; and who going to ſubdue other Princes, his young horſes meeting their females at *Komboge* (7), they mutually neighed for joy.

He who has opened again the road of liberality, which was firſt marked out in

(1) *Kedaar*—a famous place, ſituated to the north of Hindoſtan, viſited, to this day, on account of its ſuppoſed ſanctity.

(2) *Gokornaa*—a place of religious reſort near *Punjab*.

(3) This and a few other paſſages appear inconſiſtent with the principles of a *Soogot*; to reconcile it therefore, it ſhould be remarked, that, as he was iſſuing his orders to ſubjects of a different perſuaſion, it was natural for him to uſe a language the beſt calculated to ſtrike them with awe, and bind them to a performance of his commands. The *Pundit*, by whoſe aſſiſtance this tranſlation was made, when he was deſired to explain this ſeeming contradiction, aſked whether we did not, in our courts, ſwear a *Muſſulman* upon the *Koran*, and a *Hindoo* by the waters of the *Ganges*, although we ourſelves had not the leaſt faith in either.

(4) *Lockee*—the Hindoo Goddeſs of fortune.

(5) *Bodheeſotwo*—was the ſon of *Soogot*.

(6) *Beendhyo*—name of the mountains on the continent near *Ceylon*.

(7) *Komboge*—now called *Cambay*.

the

the *Kreeto Joog* (1) by *Bolee* (2), in which *Bhaargob* (3) walked in the *Tretaa Joog* (4); which was cleanſed by *Korno* (5) in the *Dwapor Joog* (6), and was again choked up in the *Kolee Joog* (7), after the death of *Sokodweeſee* (8).

He who conquered the earth from the ſource of the Ganges, as far as the well-known bridge, which was conſtructed by the enemy of *Doſaaſyo* (9); from the River of *Luckeecool* (10), as far as the ocean of the habitation of *Boroon* (11).

At *Mood-go-gheeree* (12), where is encamped his victorious army; acroſs whoſe river a bridge of boats is conſtructed for a road, which is miſtaken for a chain of mountains; where immenſe herds of elephants, like thick black clouds, ſo darken the face of day, that people think it the ſeaſon of the rains; whither the Princes of the North ſend ſo many troops of horſe, that the duſt of their hoofs ſpreads darkneſs on all ſides: whither ſo many mighty Chiefs of *Jumboodweep* (13) reſort to pay their reſpects, that the earth ſinks beneath the weight of the feet of their attendants. There *Deb Paal Deb* (who, walking in the footſteps of the mighty Lord of the great *Soogots*, the great Commander, *Raajaa* of *Mohaa Raajaas*, *Dhormo Paal Deb*, is himſelf mighty Lord of the great *Soogots*, a great Commander, and *Raajaa* of *Mohaa Raajaas*) iſſues his commands.—To all the inhabitants of the town of *Meſeeka*, ſituated in *Kreemeelaa*, in the province of *Sree Nogor* (14), which is my own property, and which is not divided by any land belonging to another: to all *Raanok* and *Raaje-pootro*; to the (15) *Omaatyo*, *Mohaa-kaarttaa-kreeteeko*, *Mohaa-Dondo-Nayk*, *Mohaa-Proteehaar*, *Mohaa-Saamont*, *Moohaa-Dow-Saadhon-Saadhoneeko*,

(1) *Kreeto Joog*—the firſt Age of the World, ſometimes called the *Suttee Joog* or age of purity.
(2) *Bolee*—a famous Giam of the firſt Age who is fabled to have conquered earth, heaven, and hell.
(3) *Bhargob*—a *Brahmon*, who having put to death all the princes of the earth, uſurped the government of the whole.
(4) *Treeto Joog*—the ſecond Age, or of three parts good.
(5) *Korno*—a famous Hero in the third Age of the World. He was General to *Doorjodhon*, whoſe wars with *Joodiſteer* are the ſubject of the *Mohabharat*, the grand Epick Poem of the Hindoos.
(6) *Dwapor Joog*—the third Age of the world.
(7) *Kolee Joog*—the fourth or preſent Age of the World, of which 4882 years are elapſed.
(8) *Sokodweeſee*—an epithet of *Beekromaadeetyo* a famous Raajaa. He ſucceeded his brother *Sokaadeetyo*, whom he put to death.
(9) *Doſaaſyo*—one of the names of *Raabon*, whoſe wars with *Raam* are the ſubject of a poem called the *Raamayon*.
(10) *Luckeecool*—now called *Luckeepoor*.
(11) *Boroon*—God of the ocean.
According to this account the Raajaa's *Dominions* extended from the Cow's Mouth to Adam's Bridge in *Ceylon*, ſaid to have been built by *Raam* in his wars with *Raabon*; from *Luckeepoor* as far as *Goozerat*.
(12) *Mood-go-gheeree*—now called *Mongueer*.
(13) *Jumboodweep*—according to the Hindoo Geography, implies the habitable part of the earth.
(14) *Sree Nogor*—the ancient name of *Patna*.
(15) *Omaatyo*, Prime Miniſter. *Mohaa-kaarttaa-kreeteeko*, Chief Inveſtigator of all things. *Mo-haa-Dondo Nayk*, Chief officer of Puniſhments. *Mohaa-Protee-haar*, Chief Keeper of the Gates. *Mohaa Saamonto*, Generaliſſimo. *Mohaa-Dow-Saadhon-Saadhoneeko*, Chief Obviator of Difficulties. *Mohaa-Kcomaaraa-Matyo*, Chief inſtructor of Children

Saadhoneeko, *Mohaa-Koomaaraa-Matyo*; to the *Promaatree* and *Sorobhongo*; to the *Raajoſtaaneeyo*, *Ooporeeko*, *Daaſaaporaadheeko*, *Chowrod-dhoroneeko*, *Daandeeko*, *Dondopaaſeeko*, *Sowl-keeko*, *Gowlmeeko*, *Kyotropo*, *Praantopaalo*, *Kothtopaalo* and *Kaandaarokyo*, to the *Todaajooktoko* and the *Beeneejooktoko*; to the keeper of the elephants, horſes and camels; to the keeper of the mares, colts, cows, buffaloes, ſheep, and goats; to the *Dootopryſoneeko*, *Gomaa-Gomeeko*, and *Obheetworomaano*; to the *Beeſoypotee*, *Toropotee* and *Toreeko*. To the different tribes *Gowr*, *Maalob*, *Khoſo*, *Hoon*, *Kooleeko*, *Kornaato*, *Laaſaato*, and *Bhoto*; to all others of our ſubjects, who are not here ſpecified; and to the inhabitants of the neighbouring villages, from the *Braahmon* and fathers of large families, to the tribes of *Medo*, *Ondhoroko*, and *Chondaalo*.

Be it known, that I have given the above-mentioned town of *Meſeeka*, whoſe limits include the fields where the cattle graze, above and below the ſurface, with all the lands belonging to it; together with all the *Mango* and *Modhoo* trees; all its waters, and all their banks and verdure; all its rents and tolls, with all fines for crimes, and rewards for catching thieves. In it there ſhall be no moleſtation, no paſſage for troops; nor ſhall any one take from it the ſmalleſt part. I give likewiſe every thing that has been poſſeſſed by the ſervants of the Raajaa: I give the Earth and Sky, as long as the Sun and Moon ſhall laſt: except, however, ſuch lands as have been given to God, and to the *Braahmons*, which they have long poſſeſſed and now enjoy. And that the glory of my father and mother, and my own fame may be increaſed, I have cauſed this *Saaſon* (1) to be engraved, and granted unto the great *Botho Beehkoraato Meeſro*, who has acquired all the wiſdom of books and has ſtudied the *Beads* (2) under *Oſlaayono*; who is deſcended from *Owpomonyobo*; who is the ſon of the learned and immaculate *Botho Boraahoraato*, and whoſe grandfather was *Botho Beeſworaato*, learned in the *Beads*, and expert in performing the *Jog* (3).

Know all the aforeſaid, that as beſtowing is meritorious, ſo taking away deſerves

Children. *Promaatree*, Keeper of the Records. *Sorobhongo*, Patrols. *Raajoſtaaneeyo*, Vice Roy. *Ooporeeko*, Superintendent. *Daaſaa-raadheeko*, Inveſtigator of Crimes. *Chow-rod-dho-roneeko*, Thief Catcher, *Daan-deeko*, Mace Bearer. *Dando-paſeeko*, Keeper of the Inſtruments of Puniſhment. *Sowl-keeko*, Collector of Cuſtoms. *Gowlmeeko*, Commander of a ſmall party. *Kyotropo*, Superviſor of Cultivation, *Praantopaalo*, Guard of the Suburbs. *Kothtopaalo*, Commander of a Fort. *Kaandaarokyo*, Guard of the Wards of the City. *Todaajooktoko*, Chief Guard of the Wards. *Beeneejooktoko*, Director of Affairs. *Dootopryſoneeko*, Chief of the Spies. *Gomaa-Gomeeko*, Meſſengers. *Obhee-woromaano*, Swift Meſſengers. *Beeſoypotee*, Governor of a City. *Toropotee*, Superintendent of the Rivers. *Toreeko*, Chief of the Boats.

(1) *Saaſon*—ſignifies an Edict.
(2) *Beads*—Hindoo Scriptures.
(3) *Jog*—Sacrifice.

puniſhment;

puniſhment; wherefore, leave it as I have granted it. Let all his neighbours and thoſe who till the land, be obedient to my commands. What you have formerly been accuſtomed to perform and pay, do it unto him in all things. Dated in the 33d *Sombot* (1), and 21ſt day of the month of *Maargo*.

Thus ſpeak the following *Slokes* (2) from the *Dhormo Onooſaaſon*:

1. "*Ram* hath required, from time to time, of all the Raajaas that may reign, "that the bridge of their beneficence be the ſame, and that they do continually "repair it.

2. "Lands have been granted by *Sogor* and many other Raajaas; and the fame "of their deeds devolves to their ſucceſſors.

3. "He who diſpoſſeſſes any one of his property, which I myſelf or others "have given, may he, becoming a worm, grow rotten in ordure with his fore-"fathers!

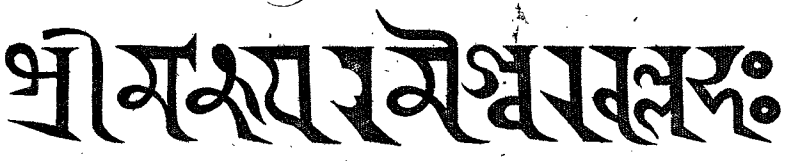
4. "Riches and the life of man are as tranſient as drops of water upon a leaf "of the Lotos. Learning this truth, O man! do not attempt to deprive another "of his reputation."

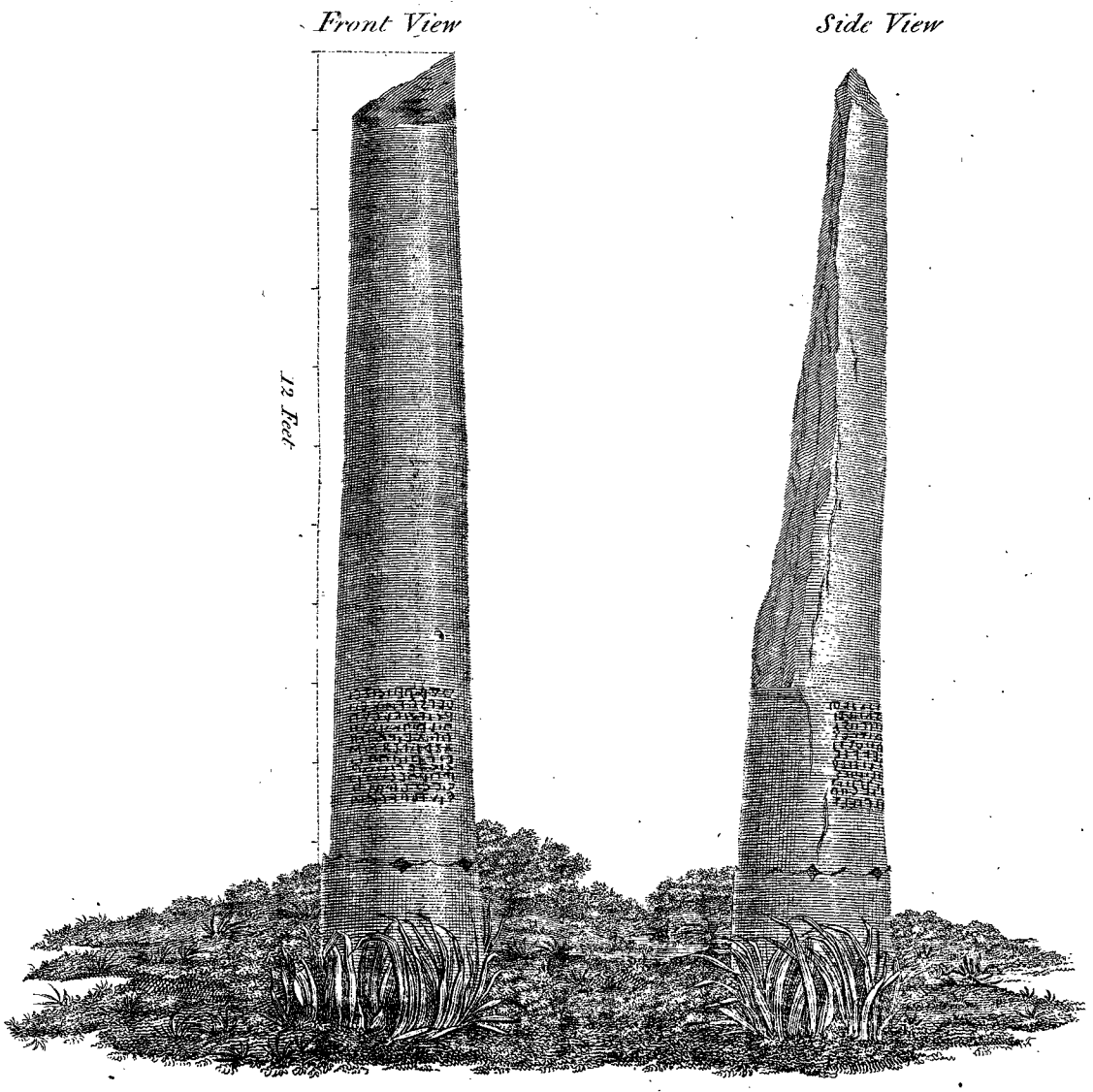
The Raajaa, for the publick good, hath appointed his virtuous ſon, *Raajyo Paal*, to the dignity of *Jowbo Raajaa*. He is in both lines of deſcent illuſtrious, and hath acquired all the knowledge of his father.

(1) *Sombot*—implies the Æra of Raajaa *Beekromadcetyo*. The *Brahmons*, throughout Hindoſtan keep time according to the three following Epochas: The *Kolyobdo* from the flight of *Kreeſhno*, or commencement of the *Kolee Joog*, 4882 years. The *Sombot*, from the death of *Beekromadcetyo*, 1837 years. The *Sokaabdo*, from the death of Raajaa *Soko*, 1703.

(2) *Slokes*—ſtanzas, commonly, but erroneouſly, written *Aſhlogues*.

Specimen of the Character in the Inscription





IV.

AN INSCRIPTION ON A PILLAR NEAR BUDDAL.

Tranſlated from the SANSCRIT *by* CHARLES WILKINS, *Eſq.*

SOME time in the month of November, in the year 1780, I diſcovered, in the vicinity of the town of *Buddal*, near which the Company have a factory, and which at that time was under my charge, a decapitated monumental column, which at a little diſtance has very much the appearance of the trunk of a coco-nut tree broken off in the middle. It ſtands in a ſwamp overgrown with weeds, near a ſmall temple dedicated to *Hărgowrēē*, whoſe image it contains. Upon my getting cloſe enough to the monument to examine it, I took its dimenſions and made a drawing of it; and ſoon after a plate was engraved, from which the accompanying is an impreſſion.

It is formed of a ſingle ſtone of a dirty grey complexion; and it has loſt by accident a conſiderable part of its original height. I was told upon the ſpot that it had, in the courſe of time, ſunk conſiderably in the ground; but upon my digging about the foundation I found this was not the caſe. At a few feet above the ground is an inſcription engraved in the ſtone, from which I took two reverſed impreſſions with printer's ink. I have lately been ſo fortunate as to decypher the character; and I have the honour to lay before the Society a tranſcript of the original in the modern writing, and a tranſlation; and at the ſame time to exhibit the two impreſſions I took from the ſtone itſelf.

The original character of this inſcription is very different from the modern form; but it ſo much reſembles that on the plate found by Col. WATSON at *Monguеer*, that I am induced to conclude it to be a work of the ſame period. The language is *Sămſkrĕĕt*, and the whole is compriſed in twenty-eight metrical verſes of various meaſures.

CHARLES WILKINS.

14th July, 1785.

I. *VEERA*

PROSPERITY!

I.

VĒĒRĂ DĒV was of the *Sāndĕĕlyă race* (1); from him was deſcended *Pānchāl*; of whoſe generation, and of whom, was *Gărgă* born.

II.

He, another *Săkră* (2), was ruler but of one quarter, and had no authority in other regions. He, too, was defeated by *Dityă* (3) chiefs; but being a virtuous prince, he became ſupreme over every country without reſerve; and his conduct was ſuch, that he laughed *Vrĕĕhăſpatĕĕ* (4) to ſcorn.

III.

Eechā (5) was his wife; and, like love, ſhe was the miſtreſs of his heart. She was admired for the native purity of her mind, and her beauty was like the light of the moon.

IV.

In his countenance, which was like the flower of the waters (6), were to be traced the lines of four ſciences (7). The three worlds were held in ſubjection by his hereditary high rank.

From theſe two was deſcended a *Brāhmăn* like *Kămălăyōnĕĕ* (8), and he took unto himſelf the name of *Srēē Dărbhă-pānĕĕ:*

V.

Whoſe country, (extending to *Rēvă-Jănăk* (9); to the father of *Gowrēē* (10) whoſe piles of rocks reek with the juice exuding from the heads of intoxicated elephants, and whoſe ſnow-white mountains are brightened by the ſun's rays; to the two oceans:—to that whence *Arŏŏn* (11) riſeth from its bed, and to that wherein

(1) A tribe of *Brāhmăns* ſtill extant.
(2) *Eendră*, the God of the Heavens, who is ſuppoſed to be the Guardian of the Eaſt.
(3) Evil ſpirits. *Eendră* is ſaid to have loſt his kingdom, for a while, to the *Aſlŏŏrs* or evil ſpirits.
(4) The tutor of the good ſpirits, and the planet Jupiter.
(5) Love, deſire.
(6) The Lotus.
(7) Arms, Muſick, Mechanicks, Phyſicks.
(8) *Brăhmā.*
(9) Perhaps the *Narbădda.*
(10) The ſnowy mountains that part India from Tartary. *Gowrēē* one of the names of the *Pārvătēē*, the conſort of *Sĕĕv.*
(11) The Charioteer of the Sun.—The Aurora of the Hindoos.

the

the ſun ſinketh in the weſt), the Prince *Srēē Dēv Pāl* (1), by his policy, rendered tributary;

VI.

At whoſe gates (although the proſpect, hidden by the duſt ariſing from the multitude of marching force, was rendered clear from the earth being watered by conſtant and abundant ſtreams flowing from the heads of luſtful elephants of various breeds), ſtood, ſcarce viſible, amongſt the vaſt concourſe of nobles flocking to his ſtandard from every quarter, *Srēē Dēv Pāl* in expectation of his ſubmiſſion.

VII.

Whoſe throne, that Prince (who was the image of *Eĕndrā*, and the duſt of whoſe feet was impreſſed with the diadems of ſundry potentates) himſelf aſcended with a flaſh of glory, although he had formerly been wont to offer him large ſums of *Pĕĕtās* (2) bright as the lunar rays.

VIII.

To him was born, of the Princeſs *Sārkārā*, the Brāhmān *Sōmēſwār*, who was like *Sōm* (3) the offspring of *Ātrĕĕ*, and a favourite of the moſt high.

IX.

He adopted the manners of *Dhānānjay* (4), and did not exult over the ignorant and ill-favoured. He ſpent his riches amongſt the needy. He neither vainly accepted adulation, nor uttered honey words. His attendants were attached by his bounty; and becauſe of his vaſt talents, which the whole univerſe could not equal, he was the wonder of all good men.

X.

Anxious for a home and an aſylum, he took the hand of *Rānnā* (5), a princeſs of his own likeneſs, according to the law, even as *Sĕĕv* the hand of *Sĕĕva* (6)—even as *Hārĕĕ* (7) the hand of *Lākſhmēē*.

XI.

From this pair proceeded into life, burſting forth like *Gŏŏbā* (8) with a counte-

(1) If this be the prince mentioned in the copper plate found by Col. WATSON, he reigned at Mongueer above 1800 years ago.
(2) A ſquare coin.
(3) The Moon.
(4) One of the ſons of Pandoo, commonly called *Arjoon*.
(5) A Princeſs of this name is alſo mentioned in Colonel WATSON's plate.
(6) *Sĕĕvā* is the feminine of *Sĕĕv*.
(7) *Harĕĕ*, a name of *Vĕĕſhnŏŏ*.
(8) *Gŏŏbā*, a name of *Kārtĕĕk*.

nance of a golden hue, the fortunate *Kĕdără Mĕĕſră*, whoſe actions rendered him the favourite of heaven.—The lofty diadem, which he had attained, ſhone with faultleſs ſplendour, kiſſing the vaſt circumference of the earth. His extenſive power was hard to be limited; and he was renowned for boundleſs knowledge raiſed from his own internal ſource.

XII.

The ocean of the four ſciences, which had been at a ſingle draught drunk up, he brought forth again, and laughed at the power of *Agăſtyă* (1).

XIII.

Truſting to his wiſdom, the king of *Gowr* (2) for a long time enjoyed the country of the eradicated race of *Ŏŏtkal* (3), of the *Hoons* (4) of humbled pride, of the kings of *Drăvĕĕr* (5) and *Gŏŏrjăr* (6), whoſe glory was reduced, and the univerſal ſea-girt throne.

XIV.

He conſidered his own acquired wealth the property of the needy, and his mind made no diſtinction between the friend and the foe. He was both afraid and aſhamed of thoſe offences, which condemn the ſoul to ſink again into the ocean of mortal birth; and he deſpiſed the pleaſures of this life, becauſe he delighted in a ſupreme abode.

XV.

To him, emblem of *Vrĕĕhăſpătĕĕ* (7), and to his religious rites, the prince *Srēē Sŏŏră Pāl* (who was a ſecond *Eendră*, and whoſe ſoldiers were fond of wounds) went repeatedly; and that long and happy companion of the world, which is girt with ſeveral oceans as with a belt, was wont, with a ſoul purified at the fountain of faith, and his head humbly bowed down, to bear pure water before him.

XVI.

Vănwā, of celeſtial birth, was his conſort, with whom neither the fickle *Lăkſhmēē* nor *Sătēē* (8) conſtant to her lord, were to be compared.

(1) Who is ſaid to have drunk up the ocean.
(2) The kingdom of *Gowr* anciently included all the countries which now form the kingdom of Bengal on this ſide the *Brăhmăpŏŏtră*, except *Mongueer*.
(3) Orixa.
(4) Huns.
(5) A country to the ſouth of the Carnatick.
(6) Goozerat.
(7) The preceptor of the good ſpirits, and the planet *Jupiter*.
(8) The conſort of *Sĕĕv*.

XVII.

XVII.

She, like another *Ḍēvăkēē* (1), bore unto him a ſon of high renown, who reſembled the adopted of *Yăsōdhā* (2) and huſband of *Lăkſhmēē* (3).

XVIII.

This youth, by name *Srēē Gŏŏrăvă Mĕĕſră*, was acquainted with all the conſtellations. He reſembled *Rām*, the ſon of *Jămădăgnĕĕ* (4). He was another *Rām*.

XIX.

His abilities were ſo great, that he was ſolicitous to diſcover the eſſence of things, wherefore he was greatly reſpected by the Prince *Srēē Nārāyăn Pāl*. What other honour was neceſſary?

XX.

His policy (who was of no mean capacity, and of a reputation not to be conceived), following the ſenſe of the *Vēds*, was of boundleſs ſplendor, and, as it were, a deſcent of *Dhărmă*, the Genius of Juſtice. It was regulated by the example of thoſe who truſt in the power of ſpeech over things future, who ſtand upon the connexion of family, who are in the exerciſe of paying due praiſe to the virtues of great men, and who believe in the purity of *Aſtrology*.

XXI.

In him was united a lovely pair, *Lăkſhmēē* and *Sărăſwătēē*, the diſpoſer of fortune, and the Goddeſs of Science, who ſeemed to have forſaken their natural enmity, and to ſtand together pointing at friendſhip.

XXII.

He laughed to ſcorn, him, who, in the aſſemblies of the learned, was intoxicated with the love of argument, and confounded him with profound and elegant diſcourſes framed according to the doctrine of the *Sāſtrăs*; and he ſpared not the man, who, becauſe of his boundleſs power and riches, was overwhelmed with the pride of victory over his enemy in the field.

XXIII.

He had a womb, but it obſtinately bore him no fruit. One like him can have

(1) The real mother of *Krĕĕſhnă*.
(2) The foſter-mother of *Krĕĕſhnă*.
(3) *Rŏŏkmĕĕnēē* the conſort of *Krĕĕſhnă*. She is here called *Lăkſhmēē*, in compliance with the idea of her being a deſcent of that goddeſs.
(4) This is neither the conqueror of *Cylon*, nor the brother of *Krĕĕſhnă*.

no

no great reliſh for the enjoyments of life! He never was bleſſed with that giver of delight, by obtaining which a man goeth unto another almoner (1).

XXIV.

He, who was, as it were, another *Vālmēēkĕĕ* (2) born in this dark age of impiety, amongſt a dreadful and a cruel race of mortals, was a devout man who diſplayed the learning of the *Vēds* in books of moral tales.

XXV.

His profound and pleaſing language, like *Găngā*, flowing in a triple courſe (3) and conſtant ſtream, purifieth and delighteth.

XXVI.

He, to whom, and to thoſe of whoſe generation, men were wont to reſort as it were to *Brăhmā*, waited ſo long in expectation of being a father, that, at length, he himſelf arrived at the ſtate of a child.

XXVII.

By him was recorded here upon this laſting column, the ſuperior beauty of whoſe ſhaft catcheth the eye of the beholder, whoſe aſpiring height is as boundleſs as his own ideas, which is, as it were, a ſtake planted in the breaſt of *Kălēē* (4), and on whoſe top ſits *Tărkſhyă* (5), the foe of ſerpents and favourite bird of *Haree*, the line of his own deſcent.

XXVIII.

Gărŏŏr, like his fame, having wandered to the extremity of the world, and deſcended even unto its foundation, was exalted here with a ſerpent in his mouth.

This work was executed by the artiſt *Bĕĕndŏŏ Bhădṛă*.

(1) He had no iſſue to perform the *Srādh* for the releaſe of his ſoul from the bonds of ſin. By *another almoner* is meant the deity.
(2) The firſt poet of the Hindoos, and ſuppoſed author of the *Rāmāyăn*.
(3) He is ſuppoſed to have written in three languages.
(4) Time.
(5) Otherwiſe called *Gărŏŏr*.

REMARKS

REMARKS ON THE TWO PRECEDING PAPERS.

By the PRESIDENT.

NO man has greater reſpect than myſelf for the talents of Mr. WILKINS, who, by decyphering and explaining the old *Sanſcrit* inſcriptions lately found in theſe provinces, has performed more than any other *European* had learning enough to accompliſh, or than any *Aſiatick* had induſtry enough even to undertake: but, ſome doubts having ariſen in my mind concerning a few paſſages in the two preceding tranſlations, I venture to propoſe them in the form of notes with entire deference to his judgement.

P. 62. *l.* 10. *this fortunate prince)*—Is not the firſt couplet in honour of BUDDHA, one of whoſe names, in the *Amarcòſh*, is SUGATA? A *follower* of his tenets would have been denominated a *Saugat*, in the derivative form. We muſt obſerve, that the *Bauddhs*, or *Saugats*, are called *Atheiſts* by the *Bráhmans*, whom they oppoſed; but it is mere invective; and this very grant fully diſproves the calumny by admitting a future ſtate of rewards and puniſhments. SUGAT was a reformer; and every reformer muſt expect to be calumniated.

P. 62. *l.* 17. *When his innumerable army)*—The third ſtanza in the original is here omitted, either by an overſight, or becauſe the ſame image of *weeping elephants* occurs afterwards, and might have been thought ſuperfluous in this place: nevertheleſs, I inſert a literal tranſlation of it.

" By whom, having conquered the earth as far as the ocean, it *was* left, as being unprofitably ſeized; ſo " *he declared: and his* elephants weeping ſaw again in the foreſts their kindred whoſe-eyes-*were*-full-of-tears."

P. 63. *l.* 9. *of many countries)*—The *Pandits* inſiſt, that *Ráſhtracúta* in the original is the name of a particular country.

P. 66. *l.* 4. *dated in the* 33*d Sombot)*—That is *year*; for *Samvat* is only an abbreviation of *Samvatſara*. This date, therefore, might only mean the thirty-third year *of the King's reign*; but, ſince VICRAMA'DITYA was ſurnamed *the foe of* SACA, and is praiſed by that name in a preceding ſtanza, we may ſafely infer, that the grant was dated thirty-three years after the death of that illuſtrious Emperor, whom the king of *Gaur*, though a ſovereign prince, acknowledged as lord paramount of *India*.

P. 68. Verſe II. a virtuous prince) Many ſtanzas in this inſcription prove, that the *Sándilya* family were not *princes*, but that ſome of them were *prime* miniſters to the kings of *Gaur*, or *Bengal*, according to this comparative genealogy.

Kings.		Miniſters *.
GO'PA'LA.		PA'NCHA'LA.
DHERMAPA'LA.		GARGA.
DE'VAPA'LA.	B. C. 23.	* DERBHAPA'NI.
RA'JYAPA'LA.		SOME'SWARA.
S'U'RAPA'LA.		* CE'DA'RAMIS'RA.
NA'RA'YANAPA'LA.	A. C. 67.	* GURAVAMIS'RA.

So that, reckoning thirty years to a generation, we may date the pillar of GURAVAMIS'RA in the ſixty-ſeventh year *after* CHRIST. A *Pandit*, named RA'DHA'CA'NTA, with whom I read the original, appeared ſtruck with my remark on the two families, and adopted it without heſitation; but, if it be juſt, the ſecond ſtanza muſt be differently interpreted. I ſuſpect *dharma*, the genius of *juſtice* or *virtue*, to be the true reading inſtead of *dharmya*, or *virtuous*, and have no doubt, that *purò* muſt be ſubſtituted for *paró*: the ſenſe will then be, that INDRA *was ruler in the Eaſt only*, and, *though valiant, had been defeated even there by the Daityas* or *Titans, but that* DHARMA *was made ſovereign over him in all quarters.*

P. 68, Ver. V. Whoſe country) The original is:

à révájanacánmatangajamadaſtimyachch'hilàſanghatéh,
à gaurípituríswar*éndra*ciranaihpuſhyatſitimnógiréh,
mártan'dáſtamayódayárun'ajaládá vár'irásidwayàt,
nítyà yasya bhuwan chacára caradán srí dévapálò nripah.

The

The father of *Révà* is the *Mahéndra* mountain in the ſouth, in which that river has its ſource; as the father of GAURI' is the *Himálaya* in the north; where IS'WARA, who has a *moon* on his forehead, is believed often to reſide: hence RA'DHA'CA'NTA propoſed a conjectural emendation, which would have done honour to SCALIGER or BENTLEY. Inſtead of *indra*, which is a name of the *ſun*, he reads *indu*, or the *moon*, by changing only a ſmall ſtraight line into a ſmall curve; and then the ſtanza will run thus:

BY whoſe policy the great Prince DE'VAPA'LA made the earth tributary, from the father of *Révà*, whoſe-piles-of-rocks-are-moiſt-with-juice-from-the-heads-of-laſcivious-elephants, to the-father-of-GAURI, whoſe-white-mountains-are-br'ightened-with-beams-from-the-moon-of-ISWARA; - *and* as far as the-two-oceans whoſe-waters-are-red-with-the-riſing-and-with-the-ſetting-Sun.

The words connected by hyphens are compounds in *Sanſcrit*.

P. 69. Verſe VI. ſubmiſſion) I underſtand *avaſara* in this place to mean the *leiſure* of the Miniſter from publick affairs, for which even the King waited at the head of his army.

P. 69. Verſe VII. ſums of *Pēētăs*) The common ſenſe of *pít'ha* is a *chair*, *ſeat*, or *throne*; and in this ſenſe it occurs in the thirteenth verſe. *Ud'upachch'habipít'ham*, or *with-a-ſeat-bright-as-the-moon*, appears to be the compound epithet of *ásanam*, or *chair of ſtate*, which though the King had often given to his Miniſter, yet, abaſhed by his wiſdom, and apprehenſive of his popularity, he had himſelf aſcended his throne *with fear*.

P. 69. Verſe X. The tenth ſtanza is extremely difficult, as it contains many words with two meanings, applied in one ſenſe to the Miniſter CE'DA'RA MIS'RA, but, in another, to CA'RTICE'YA, the *Indian* MARS: thus, in the firſt hemiſtich, *s'ic'hin* means *fire* or a *peacock*; *s'ic'há*, a *bright flame*, or a *creſt*, and *s'acti*, either *power* or a *ſpear*. As the verſe is differently underſtood, it may be a deſcription of the *Bráhmen* or of the Deity.

P. 70. Verſe XII. The *Bráhmans* of this province inſiſt, that by the four *Vidyà's*, or branches of *knowledge* are meant the four *Véda's*, not the *Upavéda's*, or *Medicine*, *Archery*, *Muſick*, and *Mechanicks*; and they cite two diſtichs from the *Agnipuráña*, in which *eighteen Vidyà's* are enumerated, and, among them, the *four Véda's*; *three* only of which are mentioned in the *Amurcòſh* and in ſeveral older books. In this verſe alſo RA'DHA'CA'NT has diſplayed his critical ſagacity: inſtead of *nála* he reads *bála*, and, if his conjecture be right, we muſt add "*even* when he was a *boy*."

P. 70. Verſe XVI. conſtant to her lord) RA'DHA'CA'NT reads *anapatyayà*, or *childleſs*, for *anupatyayà*; SATI' having borne *no children*, till ſhe became regenerate in the perſon of PA'RVATI'.

P. 71. Verſe XXIII. it obſtinately bore him no fruit) The original ſtanza is uncommonly obſure: it begins with the words *yónirbabhúva*, the two firſt ſyllables of which certainly mean *a womb*; but ſeveral *Pandits*, who were conſulted apart, are of opinion, that *yò* is the relative, of which ſome word in the maſculine gender, ſignifying *ſpeech*, is the antecedent, though not expreſſed: they explain the whole ſtanza thus---"*That ſpeech*, which came forth (*nirbabhú'va*) inconſiderately, of which *there was* no fruit, *he* "*was a man* who ſpoke nothing of that kind for his own gratification: *he was a man* alſo, by whom no "preſent-of-playthings was ever *given*, which the ſuppliant having received goes to another *more bountiful* "giver." If the relative had been *yan* in the *neuter* gender, I ſhould have acquieſced in the tranſlation offered by the *Pandits*; but the ſuppreſſion of ſo material a word as *ſpeech*, which, indeed, is commonly *feminine* in *Sanſcrit*, appears unwarrantably harſh according to *European* ideas of conſtruction.

P. 72. Verſe XXVI. If the preceding interpretation be juſt, the object of the pillar was to perpetuate the names of GURAVA MIS'RA and his anceſtors; and this verſe muſt imply, that *he expected to receive from his own ſons the pious offices, which he had performed to his forefathers*.

SOME

V.

SOME ACCOUNT OF THE SCULPTURES AND RUINS AT MAVALIPURAM, A PLACE A FEW MILES NORTH OF SADRAS, AND KNOWN TO SEAMEN BY THE NAME OF THE SEVEN PAGODAS.

By WILLIAM CHAMBERS, ESQ.

AS amidſt inquiries after the hiſtories and antiquities of *Aſia* at large, thoſe of that diviſion of it in which this Society reſides, may ſeem on many accounts to lay claim to a particular ſhare of its attention, a few hints put down from recollection, concerning ſome monuments of *Hindoo* antiquity, which, though ſituated in the neighbourhood of *European* ſettlements on the *Choromandel* coaſt, have hitherto been little obſerved, may it is conceived be acceptable, at leaſt as they may poſſibly give riſe hereafter to more accurate obſervations, and more complete diſcoveries on the ſame ſubject. The writer of this account went firſt to view them in the year 1772, and curioſity led him thither again in 1776; but as he neither meaſured the diſtances nor ſize of the objects, nor committed to writing at the time the obſervations he made on them, he hopes to be excuſed if after the lapſe of ſo many years, his recollection ſhould fail him in ſome reſpects, and his account fall far ſhort of that preciſion and exactneſs, which might have been expected, had there then exiſted in *India*, ſo powerful an incentive to diligent enquiry and accurate communication, as the eſtabliſhment of this Society muſt now prove.

The Monuments he means to deſcribe, appear to be the remains of ſome great city, that has been ruined many centuries ago; they are ſituated cloſe to the ſea, between *Covelong* and *Sadras*, ſomewhat remote from the high road, that leads to the different *European* Settlements. And when he viſited them in 1776, there was ſtill a native village adjoining to them, which retained the antient name, and in which a number of *Bramins* reſided that ſeemed perfectly well acquainted with the ſubjects of moſt of the Sculptures to be ſeen there.

The rock or rather hill of ſtone, on which great part of theſe works are executed, is one of the principal marks for mariners as they approach the coaſt, and to them the place is known by the name of the *Seven Pagodas*, poſſibly becauſe the

the ſummits of the rock have preſented them with that idea as they paſſed: but it muſt be confeſſed, that no aſpect which the hill aſſumes as viewed on the ſhore, ſeems at all to authorize this notion; and there are circumſtances, which will be mentioned in the ſequel, that would lead one to ſuſpect, that this name has ariſen from ſome ſuch number of Pagodas that formerly ſtood here, and in time have been buried in the waves. But, be that as it may, the appellation by which the natives diſtinguiſh it, is of a quite different origin; in their language, which is the *Tamulic* (improperly termed *Malabar*) the place is called *Mâvalipuram*, which in *Shanſcrit*, and the languages of the more northern *Hindoos*, would be *Mahábalipûr*, or the *City of the great Bali*. For the *Tamulians* (or *Malabars*) having no *h* in their alphabet, are under a neceſſity of ſhortening the *Shanſcrit* word Mahâ, *great*, and write it *mâ**. They are obliged alſo for a ſimilar reaſon to ſubſtitute a *v* for a *b*, in words of *Shanſcrit*, or other foreign original that begin with that letter, and the ſyllable *am* at the end is merely a termination, which, like *um* in *Latin*, is generally annexed to neuter ſubſtantives†. To this etymology of the name of this place it may be proper to add, that *Bălĭ* is the name of an hero very famous in *Hindoo* romance, and that the river *Mávaligonga*, which waters the eaſtern ſide of *Ceylone*, where the *Tamulic* language alſo prevails, has probably taken its name from him, as according to that orthography, it apparently ſignifies the *Ganges* of the great *Bălĭ*.

The rock or hill of ſtone above mentioned, is that which firſt engroſſes the attention on approaching the place; for as it riſes abruptly out of a level plain of great extent, conſiſts chiefly of one ſingle ſtone, and is ſituated very near to the ſea beach, it is ſuch a kind of object as an inquiſitive traveller would naturally turn aſide to examine. Its ſhape is alſo ſingular and romantic, and, from a diſtant view, has an appearance like ſome antique and lofty edifice. On coming near to the foot of the rock from the north, works of imagery ‡ and ſculpture croud ſo thick upon the eye, as might ſeem to favour the idea of a petrified town, like thoſe that have been fabled in different parts of the world by too credulous travellers §. Proceeding on

* They do indeed admit a ſubſtitute, but the abbreviation is moſt uſed.

† This explains alſo, why the *Shanſcrit* word Vêd, by which the *Hindoos* denominate the books of the law of their religion, is written by the *Tamulians* Vêdam, which is according to the true orthography of their language, and no miſtake of *European* travellers as ſome have ſuppoſed; while the ſame word is called Bêd by the *Bengalies*, who have in effect no *V* in their alphabet.—See Dow, Vol. I. Diſſert. P. 41.

‡ Among theſe, one object, though a mean one, attracts the attention on account of the groteſque and ridiculous nature of the deſign; it conſiſts of two monkies cut of one ſtone, one of them in a ſtooping poſture, while the other is taking the inſects out of his head.

§ See SHAW's Travels, P. 155, et ſeq.

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by the foot of the hill on the ſide facing the ſea, there is a pagoda riſing out of the ground of one ſolid ſtone, about ſixteen or eighteen feet high, which ſeems to have been cut upon the ſpot out of a detached rock, that has been found of a proper ſize for that purpoſe. The top is arched, and the ſtile of architecture according to which it is formed, different from any now uſed in thoſe parts. A little further on, there appears upon an huge ſurface of ſtone, that juts out a little from the ſide of the hill, a numerous group of human figures in baſs relief, conſiderably larger than life, repreſenting the moſt remarkable perſons, whoſe actions are celebrated in the *Mahabhârit*, each of them in an attitude, or with weapons, or other inſignia, expreſſive of his character, or of ſome one of his moſt famous exploits. All theſe figures are, doubtleſs, much leſs diſtinct than they were at firſt; for upon comparing theſe and the reſt of the ſculptures that are expoſed to the ſea air, with others at the ſame place, whoſe ſituation has afforded them protection from that element, the difference is ſtriking, the former being every where much defaced, while the others are freſh as recently finiſhed. This defacement is no where more obſervable, than in the piece of ſculpture which occurs next in the order of deſcription. This is an excavation in another part of the eaſt ſide of the great rock, which appears to have been made on the ſame plan, and for the ſame purpoſe, that Chowltries are uſually built in that country, that is to ſay, for the accommodation of travellers. The rock is hollowed out to the ſize of a ſpacious room, and two or three rows of pillars are left, as a ſeeming ſupport to the mountainous maſs of ſtone which forms the roof. Of what pattern theſe pillars have originally been, it is not eaſy now to conjecture, for the air of the ſea has greatly corroded them, as well as all the other parts of the cave. And this circumſtance renders it difficult to diſcover at firſt ſight, that there is a ſcene of ſculpture on the ſide fronting the entrance. The natives, however, point it out, and the ſubject of it is manifeſtly that of *Kriſhen* attending the herds of *Nund Ghoſe*, the *Admetus* of the *Hindoos*, from which circumſtance, *Kriſhen* is alſo called *Gopaul*, or the cowherd, as *Apollo* was entitled *Nomius*.

The objects that ſeem next to claim regard, are thoſe upon the hill itſelf, the aſcent of which, on the north, is, from its natural ſhape, gradual and eaſy at firſt, and is in other parts rendered more ſo, by very excellent ſteps cut out in ſeveral places, where the communication would be difficult or impracticable without them. A winding ſtair of this ſort leads to a kind of temple cut out of the ſolid rock, with ſome figures of idols in high relief upon its walls, very well finiſhed and perfectly freſh, as it faces the weſt, and is therefore ſheltered from the ſea air. From this temple

again there are flights of ſteps that ſeem to have led to ſome edifice, formerly ſtanding upon the hill, nor does it ſeem abſurd to ſuppoſe, that this may have been a palace, to which this temple, as a place of worſhip, may have appertained. For beſides the ſmall detached ranges of ſtairs that are here and there cut in the rock, and ſeem as if they had once led to different parts of one great building, there appear in many places, ſmall water channels cut alſo in the rock, as if for drains to an houſe, and the whole top of the hill is ſtrewed with ſmall round pieces of brick, which may be ſuppoſed from their appearance to have been worn down to their preſent form, during the lapſe of many ages. On aſcending the hill by its ſlope on the north, a very ſingular piece of ſculpture preſents itſelf to view. On a plain ſurface of the rock, which may once have ſerved as the floor of ſome apartment, there is a platform of ſtone, about eight or nine feet long, by three or four wide, in a ſituation rather elevated, with two or three ſteps leading up to it, perfectly reſembling a couch or bed, and a lion very well executed at the upper end of it by way of pillow, the whole of one piece, being part of the hill itſelf. This the *Bramins*, inhabitants of the place, call *the bed of Dermarâjah* or *Judiſhter*, the eldeſt of the five brothers whoſe fortunes and exploits are the leading ſubject in the *Mahabhârit*. And at a conſiderable diſtance from this, at ſuch a diſtance indeed as the apartment of the women might be ſuppoſed to be from that of the men, is a bath excavated alſo from the ſolid rock, with ſteps in the inſide, which the *Bramins* call the bath of *Dropedy*, the wife of *Judiſhter* and his brothers. How much credit is due to this tradition, and whether this ſtone couch may not have been anciently uſed as a kind of throne rather than a bed, is matter for future inquiry. A circumſtance, however, which may ſeem to favour this idea is, that a throne in the *Shanſcrit* and other *Hindoo* languages is called *Singhâſen*, which is compoſed of the words *Sing* a lion, and *âſen* a ſeat.

Theſe are all that appear on that part of the upper ſurface of the hill, the aſcent to which is on the north, but on deſcending from thence you are led round the hill to the oppoſite ſide, in which there are ſteps cut from the bottom to a place near the ſummit, where is an excavation that ſeems to have been intended for a place of worſhip, and contains various ſculptures of *Hindoo* Deities. The moſt remarkable of theſe, is a gigantic figure of *Viſhnoo*, aſleep on a kind of bed, with a huge ſnake wound about in many coils by way of pillow for his head, and theſe figures, according to the manner of this place, are all of one piece hewn from the body of the rock.

But though theſe works may be deemed ſtupendous, they are ſurpaſſed by others

that

that are to be ſeen at the diſtance of about a mile, or a mile and an half to the ſouthward of the hill. They conſiſt of two Pagodas of about thirty feet long by twenty feet wide, and about as many in heighth, cut out of the ſolid rock, and each conſiſting originally of one ſingle ſtone. Near theſe alſo ſtand an elephant full as big as life, and a lion much larger than the natural ſize, but very well executed, each hewn alſo out of one ſtone. None of the pieces that have fallen off in cutting theſe extraordinary ſculptures, are now to be found near or any where in the neighbourhood of them, ſo that there is no means of aſcertaining the degree of labour and time that has been ſpent upon them, nor the ſize of the rock or rocks from which they have been hewn, a circumſtance which renders their appearance the more ſtriking and ſingular. And though their ſituation is very near the ſea-beach, they have not ſuffered at all by the corroſive air of that element, which has provided them with a defence againſt itſelf, by throwing up before them a high bank that completely ſhelters them. There is alſo great ſymmetry in their form, though that of the Pagodas is different from the ſtile of architecture, according to which idol temples are now built in that country. The latter reſembles the *Egyptian*, for the towers are always pyramidical, and the gates and roofs flat and without arches, but theſe ſculptures approach nearer to the *Gothick* taſte, being ſurmounted by arched roofs or domes that are not ſemicircular but compoſed of two ſegments of circles meeting in a point at top. It is alſo obſervable that the lion in this group of ſculptures, as well as that upon the ſtone couch above mentioned, are perfectly juſt repreſentations of the true lion, and the natives there give them the name, which is always underſtood to mean a lion in the *Hindoo* language, to wit, *Sing*; but the figure which they have made to repreſent that animal in their idol temples for centuries paſt, though it bears the ſame appellation, is a diſtorted monſter totally unlike the original; inſomuch that it has from hence been ſuppoſed, that the lion was not antiently known in this country, and that *Sing* was a name given to a monſter, that exiſted only in *Hindoo* romance. But it is plain that that animal was well known to the authors of theſe works, who in manners as well as arts ſeem to have differed much from the modern *Hindoos*.

There are two circumſtances attending theſe monuments, which cannot but excite great curioſity, and on which future inquiries may poſſibly throw ſome light. One is, that on one of the Pagodas laſt mentioned, there is an inſcription of a ſingle line, in a character at preſent unknown to the *Hindoos*. It reſembles neither the *Deyva-nâgre*, nor any of the various characters connected with or derived from it, which

which have come to the writer's knowledge from any part of *Hindoſtan*. Nor did it, at the time he viewed it, appear to correſpond with any character, *Aſiatick* or *European*, that is commonly known. He had not then, however, ſeen the alphabet of the *Balic*, the learned language of the *Siameſe*, a ſight of which has ſince raiſed in his mind a ſuſpicion, that there is a near affinity between them, if the character be not identically the ſame. But as theſe conjectures, after ſuch a lapſe of time, are ſomewhat vague, and the ſubject of them is perhaps yet within the reach of our reſearches, it is to be hoped that ſome method may be fallen upon of procuring an exact copy of this inſcription.

The other circumſtance is, that though the outward form of the Pagodas is complete, the ultimate deſign of them has manifeſtly not been accompliſhed, but ſeems to have been defeated by ſome extraordinary convulſion of nature. For the weſtern ſide of the moſt northerly one, is excavated to the depth of four or five feet, and a row of pillars left on the outſide to ſupport the roof, but here the work has been ſtopped, and an uniform rent of about four inches breadth has been made throughout the ſolid rock, and appears to extend to its foundations, which are probably at a prodigious depth below the ſurface of the ground. That this rent has happened ſince the work begun, or while it was carrying on, cannot be doubted, for the marks of the maſon's tools are perfectly viſible in the excavated part on both ſides of the rent, in ſuch a manner as to ſhow plainly, that they have been divided by it. Nor is it reaſonable to ſuppoſe, that ſuch a work would ever have been deſigned or begun, upon a rock that had previouſly been rent in two.

Nothing leſs than an earthquake, and that a violent one, could apparently have produced ſuch a fiſſure in the ſolid rock; and that this has been the caſe in point of fact, may be gathered from other circumſtances, which it is neceſſary to mention in an account of this curious place.

The great rock above deſcribed is at ſome ſmall diſtance from the ſea, perhaps fifty or an hundred yards, and in that ſpace the *Hindoo* village before mentioned ſtood in 1776. But cloſe to the ſea are the remains of a Pagoda built of brick, and dedicated to *Sib*, the greateſt part of which has evidently been ſwallowed up by that element; for the door of the innermoſt apartment, in which the idol is placed, and before which there are always two or three ſpacious courts ſurrounded with walls, is now waſhed by the waves, and the pillar uſed to diſcover the meridian at the time of founding the Pagoda *, is ſeen ſtanding at ſome diſtance in the ſea.

* See Voyage du M. Gentil, Vol. I. Page 158.

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In the neighbourhood of this building, there are ſome detached rocks, waſhed alſo by the waves, on which there appear ſculptures, though now much worn and defaced. And the natives of the place declared to the writer of this account, that the more aged people among them, remembered to have ſeen the tops of ſeveral Pagodas far out in the ſea, which being covered with copper (probably gilt) were particularly viſible at ſun-riſe, as their ſhining ſurface uſed then to reflect the ſun's rays, but that now that effect was no longer produced, as the copper had ſince become incruſted with mould and verdegreaſe.

Theſe circumſtances look much like the effects of a ſudden inundation, and the rent in the rock above deſcribed, makes it reaſonable to conjecture, that an earthquake may have cauſed the ſea to overflow its boundaries; and that theſe two formidable enemies, may have joined to deſtroy this once magnificent city. The account which the *Bramins*, natives of the place, gave of its origin and downfal, partly it ſhould ſeem on the authority of the *Mahabhârit*, and partly on that of later records, at the ſame time that it countenances this idea, contains ſome other curious particulars which may ſeem to render it worthy of attention. Nor ought it to be rejected on account of that fabulous garb, in which all nations, but eſpecially thoſe of the eaſt, have always clad the events of early ages.

" *Hirinâcheren*, ſaid they, was a gigantick prince, that rolled up the earth into a " ſhapeleſs maſs, and carried it down to the abyſs, whither *Viſhnoo* followed him " in the ſhape of an hog, killed him with his tuſks, and replaced the earth in its " original ſituation. The younger brother of *Hirinâcheren* was *Hirinakaſſap*, who " ſucceeded him in his kingdom, and refuſed to do homage to *Viſhnoo*. He had a " ſon named *Pralhaud*, who at an early age openly diapproved this part of his fa- " ther's conduct, being under the tuition of *Sokerâchârj*. His father perſecuted " him on this account, baniſhed him, and even ſought to kill him, but was pre- " vented by the interpoſition of heaven, which appeared on the ſide of *Pralhaud*. " At length *Hirinakaſſap* was ſoftened, and recalled his ſon to his court, where as " he ſat in full aſſembly, he began again to argue with him againſt the ſupremacy " of *Viſhnoo*, boaſted that he himſelf was lord of all the viſible world, and aſked " what *Viſhnoo* could pretend to more. *Pralhaud* replied, that *Viſhnoo* had no " fixed abode, but was preſent every where. Is he, ſaid his father, in that pillar? " Yes, returned *Pralhaud*. Then let him come forth, ſaid *Hirinakaſſap*; and riſing " from his ſeat, ſtruck the pillar with his foot; upon which *Viſhnoo*, in the " *Naraſinghah Awtâr*, that is to ſay, with a body like a man, but an head like a " lion,

" lion, came out of the pillar and tore *Hirinakaſſap* in pieces. *Viſhnoo* then fixed " *Pralhaud* on his father's throne, and his reign was a mild and virtuous one, " and as ſuch was a contraſt to that of his father. He left a ſon named *Namachee* " who inherited his power and his virtues, and was the father of *Balee*, the founder " of the once magnificent city of *Mahâbalipoor*, the ſituation of which is ſaid to be " deſcribed in the following verſe, taken from the *Mahabhârit*.

গঙ্গায়াঃ দক্ষিণেভাগে যোজনানাং শতদ্বয়ং—
পঞ্চযোজন মাত্রো পূর্ব্বাব্ধিরিস্তু পশ্চিমে—

The ſenſe of which is literally this:

" South of the *Ganges* two hundred Yojen
" Five Yojen * weſtward from the eaſtern ſea."

Such is the *Bramin* account of the *origin* of this place. The *ſequel* of its hiſtory, according to them, is as follows:

" The ſon of *Balee* was *Banâcheren*, who is repreſented as a giant with a " thouſand hands. *Anuredh*, the ſon of *Kriſhen*, came to his court in diſguiſe, and " ſeduced his daughter, which produced a war, in the courſe of which *Anuredh* was " taken priſoner, and brought to *Mahâbalipoor*, upon which *Kriſhen* came in perſon " from his capital *Duârikah*, and laid ſiege to the place. *Sîb* guarded the gates, and " fought for *Banâcheren*, who worſhipped him with his thouſand hands, but *Kriſhen* " found means to overthrow *Sîb*, and having taken the city cut off all *Banâcheren*'s " hands except two, with which he obliged him to do him homage. He conti- " nued in ſubjection to *Kriſhen* till his death, after which a long period enſued, in " which no mention is any where made of this place, till a Prince aroſe whoſe " name was *Malêcheren*, who reſtored the kingdom to great ſplendour and enlarged " and beautified the capital. But in his time the calamity is ſaid to have happened " by which the city was entirely deſtroyed, and the cauſe and manner of it, have " been wrapt up by the *Bramins*, in the following fabulous narration. *Malêcheren*, " ſay they, in an excurſion, which he made one day alone and in diſguiſe, came " to a garden in the environs of the city, where was a fountain ſo inviting, that " two celeſtial nymphs had come down to bathe there. The *Rajah* became

* The *Yojen* is a meaſure often mentioned in the *Shanſcrit* books, and according to ſome accounts is equal to nine, according to others twelve *Engliſh* miles. But at that rate the diſtance here mentioned, between this place and the *Ganges*, is prodigiouſly exaggerated, and will carry us far ſouth of *Ceylone*; this, however, is not ſurpriſing in an *Hindoo* poem, but from the ſecond line it ſeems pretty clear that this city at the time this verſe was compoſed muſt have ſtood at a great diſtance from the ſea.

" enamoured

" enamoured of one of them, who condeſcended to allow of his attachment to " her, and ſhe and her ſiſter nymph uſed thenceforward to have frequent inter- " views with him in that garden. On one of thoſe occaſions, they brought with " them a male inhabitant of the heavenly regions, to whom they introduced the " *Rajah*; and between him and *Malêcheren* a ſtrict friendſhip enſued. In conſe- " quence of which he agreed, at the *Rajah*'s earneſt requeſt, to carry him in diſ- " guiſe to ſee the court of the divine *Inder*, a favour never before granted to any " mortal. The *Rajah* returned from thence, with new ideas of ſplendour and " magnificence, which he immediately adopted in regulating his court, and his re- " tinue, and in beautifying his ſeat of government. By this means *Mahâbalipoor* " became ſoon celebrated beyond all the cities of the earth, and an account of its " magnificence having been brought to the gods aſſembled at the court of *Inder*, " their jealouſy was ſo much excited at it, that they ſent orders to the God of the " ſea to let looſe his billows and overflow a place, which impiouſly pretended to " vie in ſplendour, with their celeſtial manſions. This command he obeyed, and " the city was at once overflowed by that furious element, nor has it ever ſince " been able to rear its head."

Such is the mode in which the *Bramins* chuſe to account for the ſignal overthrow of a place, devoted to their wretched ſuperſtitions.

It is not, however, improbable, that the reſt of this hiſtory may contain, like the mythology of *Greece* and *Rome*, a great deal of real matter of fact, though enveloped in dark and figurative repreſentations. Through the diſguiſe of theſe, we may diſcern ſome imperfect records of great events, and of revolutions that have happened in remote times, and they perhaps merit our attention the more, as it is not likely that any records of ancient *Hindoo* hiſtory exiſt, but in this obſcure and fantaſtic dreſs. Their poets ſeem to have been their only hiſtorians, as well as divines, and whatever they relate, is wrapped up in this burleſque garb, ſet off, by way of ornament, with circumſtances hugely incredible and abſurd, and all this without any date, and in no other order or method, than ſuch as the poet's fancy ſuggeſted, and found moſt convenient. Nevertheleſs, by comparing names and grand events, recorded by them, with thoſe interſperſed in the hiſtories of other nations, and by calling in the aſſiſtance of ancient monuments, coins, and inſcriptions as occaſion ſhall offer, ſome probable conjectures at leaſt, if not important diſcoveries, may, it is hoped, be made on theſe intereſting ſubjects. It is much to be regretted, that a blind zeal, attended with a total want of curioſity, in the *Mohammedan*

medan governors of this country, have been ſo hoſtile to the preſervation of *Hindoo* monuments and coins. But a ſpirit of inquiry among *Europeans* may yet perhaps be ſucceſsful, and an inſtance which relates to the place above deſcribed, though in itſelf a ſubject of regret, leaves room to hope, that futurity may yet have in ſtore ſome uſeful diſcoveries. The *Kauzy* of *Madras*, who had often occaſion to go to a place in the neighbourhood of *Mahâbalipoor*, aſſured the writer of this account, that within his remembrance, a ryot of thoſe parts had found, in plowing his ground, a pot of gold and ſilver coins, with characters on them which no one in thoſe parts, *Hindoo* or *Mohammedan*, was able to decypher. He added, however, that all ſearch for them would now be vain, for they had doubtleſs been long ago devoted to the crucible, as, in their original form, no one there thought them of any value.

The inſcription on the Pagoda mentioned above, is an object, which, in this point of view, appears to merit great attention. That the conjecture, however, which places it among the languages of *Siam*, may not ſeem in itſelf chimerical, the following paſſages from ſome authors of repute, are here inſerted to ſhow, that the idea of a communication having formerly ſubſiſted between that country and the Coaſt of *Choromandel*, is by no means without foundation, nay, that there is ſome affinity, even at this day, between the *Balic* and ſome of the *Hindoo* languages, and that the ſame mode of worſhip ſeems formerly to have prevailed in the *Deckan*, which is now uſed by the *Siameſe*.

MONSIEUR DE LA LOUBERE, in his excellent account of *Siam*, ſpeaks thus of the origin of the *Balic* language:

" The Siameſe, ſays he, do not mention any country, where the Balic language, " which is that of their laws and their religion, is at preſent in uſe. They ſuppoſe, " indeed, on the report of ſome among them, who have been on the Coaſt of " Choromandel, that it bears ſome reſemblance to ſome of the dialects of that " country, but they at the ſame time allow, that the character in which it is " written, is not known but among themſelves. The ſecular miſſionaries ſettled at " Siam believe that this language is not entirely a dead one; becauſe they have " ſeen in their hoſpital, a man from the neighbourhood of Cape Comorin, who " mixed ſeveral Balic words in his diſcourſe, declaring that they were in uſe in his " country, and that he himſelf had never ſtudied nor knew any other than his " mother tongue. They at the ſame time mention, as matter of certainty, that the religion

" religion of the Siameſe comes from thoſe parts, as they have read in a Balic book " that Sommonacodom, the idol of the Siameſe, was the ſon of a king of Ceylone *."

The language of the man mentioned in this paſſage, who came from the neighbourhood of *Cape Comorin*, could be no other than the *Tamulic*; but the words here alluded to may very poſſibly have been derivatives from the *Shanſcrit*, common to both that and the *Balic*.

In another part of the ſame work, where the author treats of the hiſtory of *Sommonacodom* at large, on the authority of the *Balic* books, he ſays:

" The father of Sommonacodom, according to the ſame Balic book, was a " king of Teve Lanca, that is to ſay, of the famous Ceylone †."

Here it is obſervable that while the country of *Siam* ſeems to be utterly unknown, both to the natives of *Ceylone* and *Hindoſtan*, *Ceylone* ſhould nevertheleſs be ſo well known to the *Siameſe*, and under the ſame appellation it bears in the *Shanſcrit*. An epithet is alſo here prefixed to it, which ſeems to be the ſame as that uſed by the *Hindoos* in ſpeaking of that iſland, for they alſo call it in *Shanſcrit Dêve Lanca* or *the Sacred Lanca*. From ſeveral paſſages in the ſame work it alſo appears, that the *Shanſcrit* word *Mahâ*, which ſignifies *great*, is conſtantly uſed in the *Balic* language in the ſame ſenſe. And the names of the days of the week are moſt of them the ſame in *Shanſcrit* and in *Balic*, as may be ſeen in the following compariſon of them.

Shanſcrit.	*Balic.*	
Aditta-vâr,	Van Athit,	Sunday.
Soma-vâr,	Van ‡ Tchân,	Monday.
Mungela-vâr,	Van Angkaan,	Tueſday.
Bouta-vâr,	Van Pout,	Wedneſday.
Brahſpati-vâr,	Van Prahout,	Thurſday.
Soucra-vâr,	Van Souc,	Friday.
Sany-vâr,	Van Sâoa,	Saturday.

* " Les Siamois ne nomment aucun pays, où la langue Bali, qui eſt celle de leurs loix et de leur religion, ſoit " aujourd'hui en uſage. Ils ſoupçonnent à la vérité, ſur la rapport de quelques-uns d'entre eux, qui ont été à la côte " de Coromandel, que la langue Balic a quelque reſemblance avec quelqu'un des dialects de ce pays-là: mais ils con- " viennent en même temps que les lettres de la langue Balic ne ſont connues que chez eux. Les Miſſion- " naires ſéculiers à Siam croyent que cette langue n'eſt pas entièrement morte; parce qu'ils ont vu dans leur " hopital un homme des environs du Cap de Comorin, qui metoit pluſieurs mots Balis dans ſon langage, aſſurant " qu'ils etoient en uſage en ſon pays, et que lui n'avoit jamais etudié et ne ſavoit que ſa langue maternelle. Ils " donnent d'ailleurs pour certain que la religion des Siamois vient de ces quartiers-là, parce qu'ils ont lu dans un livre " Balic que Sommonacodom, que les Siamois adorent, etoit fils d'un Roi de l'iſle de Ceylone."

† " Le père de Sommonacodom etoit, ſelon ce même livre Bali, un Roi de Teve Lanca, c'eſt à dire, un Roi de la " célébré Ceylan."

‡ Here one *Hindoo* word is ſubſtituted for another, for *Tchân* in *Hindoſtany*, and *Tchänder* in *Shanſcrit*, ſignify the moon as well as *Soma*.

The ſame author gives, in another place, an account of a pretended print of a foot on a rock, which is an object of worſhip to the *Siameſe*, and is called *Prabât*, or the venerable foot. For *Prâ* in *Balic*, he ſays, ſignifies *venerable*, which agrees with *prâper* and *prameſht* in *Shanſcrit*; and *Bât* in the ſame tongue is a foot, as *Pâd* in *Shanſcrit*. After which he goes on to ſay:

" We know that in the iſland of Ceylone, there is a pretended print of a human " foot, which has long been held in great veneration. It repreſents, doubtleſs, the " left foot, for the Siameſe ſay that Sommonacodom ſet his right foot on their " *Prabat*, and his left foot at Lanca *."

From KNOX's hiſtory of *Ceylone* it appears, that the impreſſion here ſpoken of is upon the hill called by the *Chingelays Hamalell*, by *Europeans Adam's Peak*. And that the natives believe it to be the foot-ſtep of their great idol *Buddou*. Between the worſhip of whom, as deſcribed by KNOX, and that of *Sommonacodom*, as related by M. DE LA LOUBERE, there is a ſtriking reſemblance in many particulars, which it may be proper here to enumerate.

1ſt. Beſides the foot-ſteps above mentioned, there is a kind of tree (which from deſcription appears to be the *Pipel* tree, ſo well known in *India*), which the *Chingelays* hold ſacred to *Buddou*, and the *Siameſe* to *Sommonacodom*. Inſomuch that the latter deem it meritorious to hang themſelves upon it. The *Chingelays* called it *Bogahah*; for *gahah*, in their language, ſignifies a tree, and *bo* ſeems to be an abbreviation of *Bod* or *Buddou*; and the *Siameſe* call it in *Balic*, *Pra ſi Mahà Pout*, which, according to DE LA LOUBERE'S interpretation, ſignifies the tree of the great *Pout* †. This he ſuppoſes to mean *Mercury*, for he obſerves that *Pout* or *Poot* is the name of that planet in the *Balic* term for *Wedneſday*; and in another place, he ſays, *Pout* is one of the names of *Sommonacodom*. It is certain that *Wedneſday* is called the day of *Bod* or *Budd* in all the *Hindoo* languages, among which the *Tamulic*, having no *b*, begins the word with a *p*, which brings it very near the *Balic* mode of writing it. It is equally certain that the days of the week in all theſe languages, are called after the planets in the ſame order as with us, and that *Bod*, *Budd*, or *Pood*, holds the place of *Mercury*. From all which it ſhould appear that *Pout*, which among the *Siameſe* is another name for *Sommonacodom*, is itſelf a corruption of *Buddou*, who is the *Mercury* of the *Greeks*. And it is ſingular

* " On ſait que dans l'iſle de Ceylan, il y a un pretendu veſtige de pied humain, que depuis long-temps y eſt en " grande veneration. Il repreſente ſans doute le pied gauche; car les Siamois diſent que Sommonacodom poſa le pied " droit à leur *prabat*, et le pied gauche à Lancà."

† In vulgar *Siameſe* they call it *Ton-pô*.

that,

that, according to M. DE LA LOUBERE, the mother of *Sommonacodom* is called in *Balic Maha-mania*, or the *great Mania*, which reſembles much the name of *Maia*, the mother of *Mercury*. At the ſame time that the *Tamulic* termination *en*, which renders the word *Pooden*, creates a reſemblance between this and the *Woden* of the *Gothick* nations, from which the ſame day of the week is denominated, and which on that and other accounts is allowed to be the *Mercury* of the *Greeks*.

2*dly*. The temples of *Sommonacodom* are called *Pihân*, and round them are habitations for the prieſts reſembling a college; ſo thoſe of *Boddou* are called *Vihâr*, and the principal prieſts live in them as in a college. The word *Vihâr*, or as the natives of *Bengal* would write it *Bihâr*, is *Shanſcrit*; and *Feriſhtah*, in his hiſtory of *Bengal*, ſays, that this name was given by the *Hindoos* to the province of *Behâr*, becauſe it was formerly ſo full of *Bramins* as to be, as it were, one great *ſeminary of Learning*, as the word imports.

3*dly*. The *Siameſe* have two orders of prieſts, and ſo have the worſhippers of *Buddou*. Both the one and the other are diſtinguiſhed by a yellow habit, and by another circumſtance which muſt be mentioned in the words of the reſpective authors. KNOX ſays of the *Buddou* prieſts, "They have the honour of carrying "the *Tallipot* with the broad end over their heads foremoſt, which none but the "king does." And M. DE LA LOUBERE ſays of the *Siameſe* prieſts, "To defend "themſelves from the ſun they have the *Talapat*, which is their little umbrella in "the form of a ſcreen *."

The word here uſed is common to moſt of the *Hindoo* languages, and ſignifies *the leaf of the Palmyra tree*. M. DE LA LOUBERE mentions it as a *Siameſe* word, without ſeeming to know its origin or primary ſignification.

4*thly*. The prieſts of *Buddou*, as well as thoſe of *Sommonacodom*, are bound to celibacy, as long as they continue in the profeſſion; but both the one and the other are allowed to lay it down and marry.

5*thly*. They both eat fleſh, but will not kill the animal.

6*thly*. The prieſts of either nation are of no particular tribe, but are choſen out of the body of the people.

Theſe circumſtances plainly ſhow that this is a ſyſtem of religion different from that of the *Vêds*, and ſome of them are totally inconſiſtent with the principles and practice of the *Bramins*. And indeed it is manifeſt from KNOX's whole account,

* "Pour ſe garentir du ſoleil ils ont le Talapat, qui eſt leur petit parafol en forme d'ecran."

that

that the religion of the *Chingelays* is quite diſtinct from that which prevails at this day among the *Hindoos*, nor does it appear that there is ſuch a race of men as that of the *Bramins* among them. The only part in which there ſeems to be any agreement is in the worſhip of the *Debtahs*, which has probably crept in among them from their *Tamulian* neighbours, but that is carried on in a manner very different from the *Braminical* ſyſtem, and appears to be held by the nation at large in very great contempt if not abhorrence. KNOX's account of it is this: "Their temples "(i. e. thoſe of the *Debtahs*) are, he ſays, called *Covels*," which is the *Tamulic* word for *Pagoda*. He then goes on to ſay, "A man piouſly diſpoſed, builds a ſmall houſe "at his own charge, which is the *temple*, and *himſelf becomes prieſt thereof*. This houſe "is ſeldom called *God's Houſe*, but moſt uſually *Jacco* the *Devil's*." But of the prevailing religion he ſpeaks in very different terms, and deſcribes it as carried on with much parade and ſplendour, and attended with marks of great antiquity. "The "Pagodas or temples of their Gods, ſays he, are ſo many that I cannot number them. "Many of them are of rare and exquiſite work, built of hewn ſtone, engraven with "images and figures, but by whom and when I could not attain to know, the in-"habitants themſelves being ignorant therein. But ſure I am they were built by far "more ingenious artificers than the Chingelays that now are on the land. For the "Portugueſe in their invaſions have defaced ſome of them, which there is none "found that hath ſkill enough to repair to this day." In another place, he ſays, "Here are ſome antient writings engraven upon rocks which puzzle all that ſee "them. There are divers great rocks in divers parts in *Cande Uda*, and in the "northern parts. Theſe rocks are cut deep with great letters for the ſpace of ſome "yards, ſo deep that they may laſt to the world's end. No body can read them, "or make any thing of them. I have aſked Malabars and Gentoos, as well as "Chingelays and Moors, but none of them underſtood them. There is an antient "temple, Goddiladenni in Yattanour, ſtands by a place where there are of theſe "letters." From all which the antiquity of the nation and their religion is ſufficiently evident, and from other paſſages it is plain, that the worſhip of *Buddou* in particular, has been from remote times a very eminent part of that religion; for the ſame author, ſpeaking of the tree at *Anurodgburro*, in the northern part of the iſland, which is ſacred to *Buddou*, ſays, "The due performance of this worſhip "they reckon not a little meritorious: inſomuch that, as they report, ninety kings "have reigned there ſucceſſively, where, by the ruins that ſtill remain, it appears "they ſpared not for pains and labour, to build temples and high monuments to

"the

" the honour of this God, as if they had been born to hew rocks and great ſtones, " and lay them up in heaps. Theſe kings are now happy ſpirits, having merited " it by theſe labours." And again he ſays, " For this God above all other, they " ſeem to have an high reſpect and devotion," &c.

And from other authorities it will appear, that this worſhip has formerly been by no means confined to *Ceylone*, but has prevailed in ſeveral parts of *India* prior to that of the *Bramins*, nay that this has been the caſe even ſo late as the ninth and twelfth centuries of the *Chriſtian* Æra.

In the well known * *Anciennes Relations*, tranſlated from the *Arabick*, by that eminent Orientaliſt EUSEBIUS RENAUDOT, the *Arabian* traveller gives this account of the cuſtom of dancing-women, which continues to this day in the *Decan*, but is not known among the *Hindoos* of *Bengal* or *Hindoſtan* proper.

" There are in India publick women, called *women of the idol*, and the origin of " this cuſtom is this: when a woman has made a vow for the purpoſe of having " children, if ſhe brings into the world a pretty daughter, ſhe carries it to *Bod*, ſo " they call the idol which they adore, and leaves it with him †."

This is a pretty juſt account of this cuſtom, as it prevails at this day in the *Decan*, for children are indeed devoted to this profeſſion by their parents, and when they grow up in it, they are called in *Tamulic Devadâſi* or *female ſlaves of the idol*. But it is evident they have changed their maſter ſince this *Arabian* account was written, for there is no idol of the name of *Bod* now worſhipped there. And the circumſtance, of this cuſtom being unknown in other parts of *India*, would lead one to ſuſpect, that the *Bramins*, on introducing their ſyſtem of religion into that country, had thought fit to retain this part of the former worſhip, as being equally agreeable to themſelves and their new diſciples.

The ſame *Arabian* travellers give us an account of a very powerful race of *Hindoo* kings, according to them indeed the moſt powerful in *India*, who then reigned on the *Malabar* coaſt with the title of *Balhâra*. Their dominion appears to have extended over *Guzerat*, and the greateſt part, if not the whole, of the antient kingdom of *Viſiapoor*. For the *Arabian* geographer quoted by M. RENAUDOT, makes *Nahelvârah* the metropolis of theſe princes, which is doubtleſs *Nahervalah*, the

* Anciennes relations des Indes et de la Chine, de deux voyageurs Mohametans, qui y allèrent dans le neuvième ſiècle. *Paris*, 1718, 8vo.

† " Il y a dans les Indes des femmes publiques, appellés femmes de l'idole, l'origine de cette couſtume eſt telle: " Lors qu'une femme a fait un voeu pour avoir des enfans, ſi elle met au monde une belle fille, elle l'apporte au *Bod*, " c'eſt ainſi qu'ils appellent l'idole qu'ils adorent, auprès duquel elle la laiſſe, &c." Anc. Rel. p. 109.

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antient capital of *Guzerat*, though M. RENAUDOT ſeems not to have known that place; and the reſt of the deſcription ſufficiently ſhows the great extent of their dominion ſouthward. M. D'ANVILLE ſpeaks of this race of kings on the authority of the *Arabian* geographer EDRISI, who wrote in the twelfth century, according to whom it appears that their religion was, even ſo late as that period, not the *Braminical*, but that of which we are now ſpeaking. M. D'ANVILLE'S words are theſe: "Edriſi acquaints us with the religion which this prince profeſſed in ſaying, "that his worſhip was addreſſed to *Bodda*, who according to St. Jerome and "Clemens Alexandrinus was the founder of the ſect of the Gymnoſophiſts, in like "manner as the Bramins were uſed to attribute their inſtitution to Brahma *."

The authority of CLEMENS ALEXANDRINUS is alſo cited on the ſame ſubject by RELANDUS in his 11th Diſſertation, where, treating of the language of *Ceylone*, he explains the word *Vehâr*, above ſpoken of, in theſe terms:

"Vehâr ſignifies a temple of their principal God Buddou, who, as Clemens "Alexandrinus has long ago obſerved, was worſhipped as a God by the "Hindoos †"

After the above quotations, the following extract from the voyage of that inquiſitive and ingenious traveller M. GENTIL, publiſhed in 1779, is given as a further and very remarkable illuſtration of this ſubject.

"This ſyſtem is alſo that of the Bramins of our time; it forms the baſis of that "religion, which they have brought with them into the ſouthern parts of the "Peninſula of Hindoſtan, into Madura, Tanjore, and Maiſſore.

"There was then in thoſe parts of India, and principally on the Coaſt of Choro-"mandel and Ceylone, a ſort of worſhip, the precepts of which we are quite unac-"quainted with. The god Baouth, of whom at preſent they know no more in India "than the name, was the object of this worſhip; but it is now totally aboliſhed, "except that there may poſſibly yet be found ſome families of Indians, who have "remained faithful to Baouth, and do not acknowledge the religion of the Bra-"mins, and who are on that account ſeparated from and deſpiſed by the other caſts.

"I have not indeed heard that there are any ſuch families in the neighbourhood "of Pondichery, but there is a circumſtance well worthy of remark, which none "of the travellers that have treated of the Coaſt of Choromandel and Pondichery

* "L'Edriſi nous inſtruit ſur la religion que profeſſoit ce Prince, en diſant que ſon culte s'adreſſoit à Bodda, que "ſelon St. JEROME et St. CLEMENT D'ALEXANDRIE, avoit été l'inſtituteur des Gymnophiſtes comme les Brach-"manes rapportoient à Brahma leur inſtitut." Ant. Geog. de l'Inde, p. 94.

† "*Vehâr*, templum dei primarii Buddoe βουττα quem Indos ut Deum venerari jam olim notavit Clemens Alexan-"drinus." Strom. lib. 1. p. 223. Rel. Diſs. pars tertia, p. 85.

"ſeem

" ſeem to have noticed. It is this, that at a ſhort league's diſtance to the ſouth of " this town, in the plain of Virapatnam, and pretty near the river, we find a ſtatue " of granite very hard and beautiful. This ſtatue, which is from three feet to three " and an half in heighth, is ſunk in the ſand to the waiſt, and weighs doubtleſs " many thouſand weight; it is, as it were, abandoned in the midſt of this extenſive " plain. I cannot give a better idea of it, than by ſaying, that it exactly agrees " with and reſembles the Sommonacodom of the Siameſe; its head is of the ſame " form, it has the ſame features, its arms are in the ſame attitude, and its ears are " exactly ſimilar. The form of this divinity, which has certainly been made in the " country, and which in no reſpect reſembles the preſent idols of the Gentoos, " ſtruck me as I paſſed this plain; I made various inquiries concerning this ſingular " figure, and the Tamulians one and all aſſured me that this was the god Baouth, " who was now no longer regarded, for that his worſhip and his feſtivals had been " aboliſhed, ever ſince the Bramins had made themſelves maſters of the people's " faith *."

M. GENTIL then goes on to ſay a good deal more upon this ſubject, in the courſe of which he ſuppoſes, that this deity is the *Fo* of the *Chineſe*, whoſe worſhip, by their own accounts, was brought from *India*. And indeed the abridgment of the name *Pout*, mentioned in a note of this paper, which the vulgar *Siameſe* reduce to the ſingle ſyllable *Po*, ſeems to countenance this opinion. But as this is foreign to our preſent purpoſe, and the above paſſages, it is hoped, are ſufficient to eſtabliſh what was propoſed, it ſeems high time to take leave of this ſubject, with an apology for that prolixity, which is inſeparable from this kind of diſcuſſion.

17th June, 1784.

* " Ce ſyſtême eſt auſſi celui des Brames de nos jours; il fait la baſe de la religion qu'ils ont apportée dans le ſud " de le preſqu'iſle de l'Indoſtan, le Madure, le Tanjaour, et le Maiſſour.

" Il y avoit alors dans ces parties de l'Inde, et principalement à la côte de Coromandel et à Ceylan, un culte dont " on ignore abſolument les dogmes: le dieu Baouth, dont on ne connoit aujourd'hui, dans l'Inde, que le nom, etoit " l'objet de ce culte; mais il eſt tout-à-fait aboli, ſi ce n'eſt qu'il ſe trouve encore quelques familles d'Indiens ſéparées " et mépriſées des autres caſtes, qui ſont reſtées fidelles à Baouth, et qui ne reconnoiſſent point la religion des Brames.

" Je n'ai pas entendu dire qu'il y ait de ces familles aux environs de Pondichery; cependant, une choſe très-digne de " remarque, et à laquelle aucun des voyageurs qui parlent de la côte de Coromandel et de Pondichery, n'ont fait " attention, eſt que l'on trouve à une petite lieue au ſud de cette ville, dans la plaine de Virapatnam, aſſez près de la " rivière, une ſtatue de *Granit* très-dur et très-beau: cette ſtatue, d'environ trois pieds à trois pieds et demi de hau- " teur, eſt enfoncée dans le ſable juſqu'à la ceinture, et peſe ſans doute pluſieurs milliers; elle eſt comme aban- " donnée au milieu de cette vaſte plaine: je ne peux mieux en donner une idée, qu'en diſant qu'elle eſt exactement " conforme et reſſemblante à *Sommonacodom* des Siamois; c'eſt la même forme de tête, ce ſont les mêmes traits dans " le viſage, c'eſt la même attitude dans les bras, et les oreilles ſont abſolument ſemblables. La forme de cette " divinité, qui certainement a été faite dans le pays, et qui ne reſſemble en rien aux divinités actuelles des Gentils, " m'avoit frappé lorſque je paſſai dans cette plaine; je fis diverſes informations ſur cette figure ſingulière, les Tamoults " m'aſſurèrent tous que c'etoit Baouth qu'on ne regardoit plus; que ſon culte et ſes fêtes etoient ceſſées depuis que les " Brames s'etoient rendus les maitres de la croyance du peuple."

VI. HINTS

VI.

HINTS RELATIVE TO FRICTION IN MECHANICKS.

By Mr. Reuben Burrow.

HYPOTHESIS.

IN the following eſtimation of friction, the weight or force neceſſary to overcome the reſiſtance, &c. is ſuppoſed to be proportional to the preſſure.

OF FRICTION IN THE INCLINED PLANE.

Let AB be an inclined plane *, and let PR repreſent a weight ſuſtained on it by any force Rm acting in the direction Rm; and draw PD perpendicular to AB, and let Rm meet PD in n: Now as Rn repreſents the force that would be neceſſary to ſuſtain the body, excluſive of friction, and Pn repreſents the preſſure againſt the plane; if mt be drawn perpendicular to PD meeting it in t, then will nm be the force neceſſary to overcome the friction in that direction, and Pt the real preſſure againſt the plane AB, when the whole force Rm neceſſary to overcome both the weight and the friction, acts in the direction Rm; and as the force nm is equivalent to nt and tm; and nt has no other effect than to alter the preſſure, therefore tm is the only force which overcomes the reſiſtance of friction; and as this force is as the preſſure, therefore tm is proportional to Pt, and hence the Locus of all the points m, is a right line.

Again, ſuppoſe the body, inſtead of being drawn along, to be ſuſtained at reſt only upon the plane; this, it is evident, will require a leſs force than the other, becauſe the friction prevents the body in part from deſcending †: Let Rm be the force required, and let the ſame conſtruction be made as before; then becauſe Rn is the force that would be neceſſary if there was no friction; mn is the effect of the friction itſelf; but mn is equivalent to the forces mt and tn; and as Pn would be the preſſure excluſive of friction, Pt is the preſſure incluſive; and as the force loſt is as the friction, and mt is as the force loſt, therefore mt is as Pt, for the friction is as the preſſure; conſequently the Locus of all the points m is a right line paſſing

* Fig. 1. † Fig. 2.

through

Fig. 1.

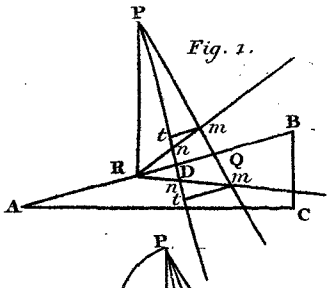


Fig. 2.

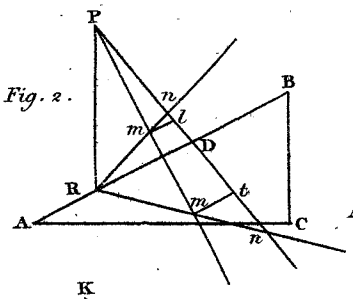


Fig. 3.

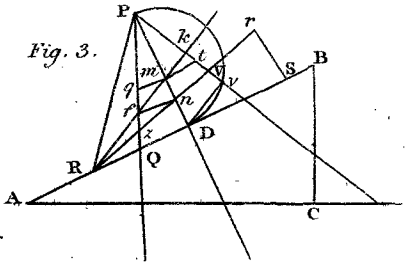


Fig. 4.

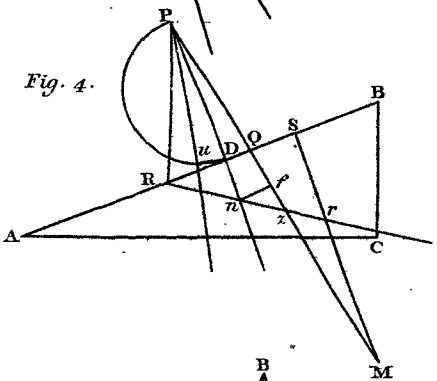


Fig. 5.

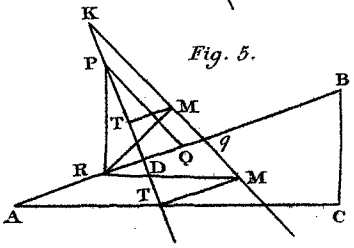


Fig. 6.

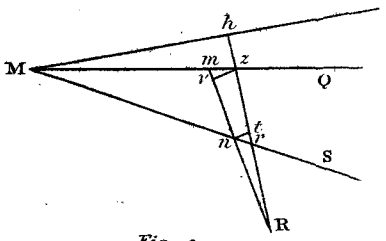


Fig. 7.

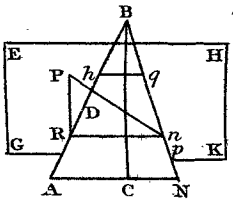


Fig. 8.

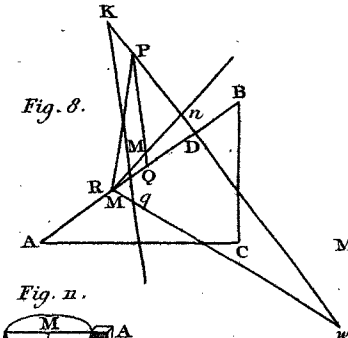


Fig. 9.

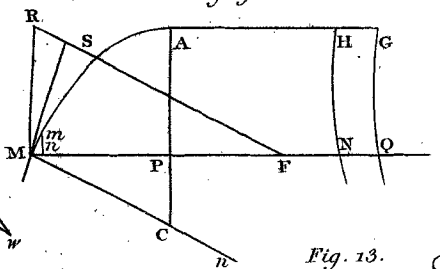


Fig. 10.

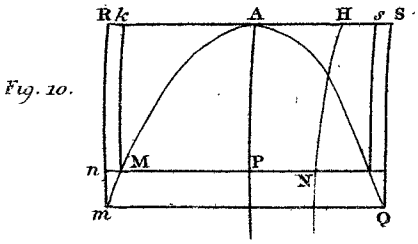


Fig. 11.

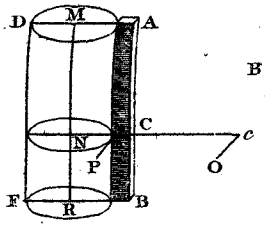


Fig. 12.

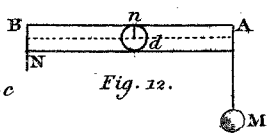


Fig. 13.

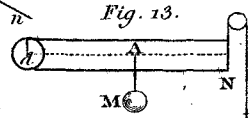


Fig. 14.

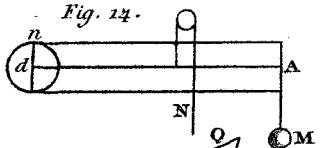


Fig. 15.

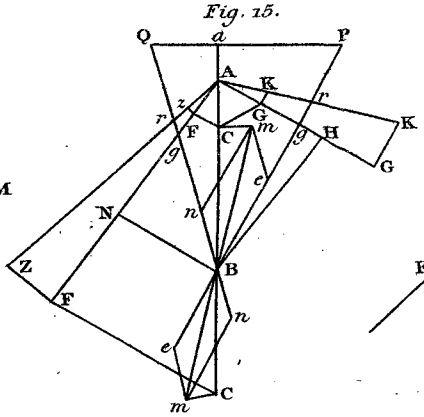


Fig. 16.

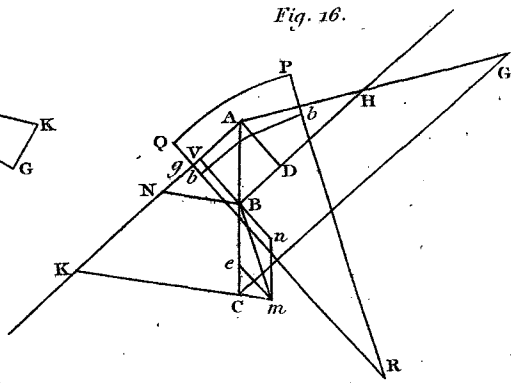
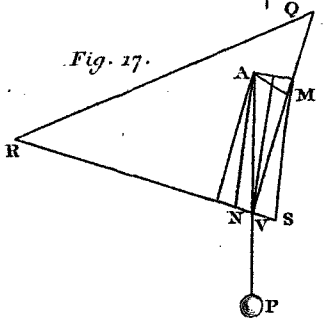


Fig. 17.



through P, and making the ſame angle as DPQ in the former caſe, and only differing by being drawn on the contrary ſide of PD.

SCHOLIUM.

In what follows, the force requiſite to ſuſtain any body is conſidered under three different diſtinctions; firſt, when it is juſt barely ſufficient to overcome the weight and reſiſtance ariſing from friction, and the body is conſidered as juſt beginning to move in the direction of the force applied, and the force in this caſe is called the *moving force*: ſecondly, when this force is diminiſhed till the body would begin to move or deſcend in a contrary direction if the force was diminiſhed farther; this laſt I call the *ſuſpending force*; and it is plain that whatever force is applied to the body leſs than the moving, and greater than the ſuſpending force, the body will remain at reſt: laſtly, it is manifeſt that there is an intermediate ſtate in which ſuch a degree of force may be applied, that the friction will have no effect either way; and this force is the ſame as would keep the body in equilibrio if there was no friction, becauſe the effect or tendency of friction is to keep the body at reſt, or prevent it from moving either way; this being premiſed there will be little difficulty in the following.

PROBLEM I.

Having given the weight of the body to be ſuſtained; the inclination of the plane and the ratio of the friction to the preſſure; to find the force requiſite to ſuſtain the weight in a given direction.

In the foregoing figures, draw PR and PD at right angles to the horizon and plane reſpectively, PR repreſenting the weight; take PD to DQ as the preſſure to the friction, and let DQ be taken upwards or downwards as the requiſite force is motive or ſuſpenſive; join PQ and draw the line Rm in the given direction meeting PQ in m; then Rm is the force required.

COROLLARY 1. If the friction be the n part of the preſſure, and W be the weight, s and c the ſine and coſine of the plane's elevation, then the moving force parallel to the plane will be W $(s+c:n)$, and the ſuſpending force W $(s-c:n)$.

COROLLARY 2. If the direction of the force be parallel to the horizon, and t be the tangent of the plane's elevation, then W $(tn+1):(n-t)$ will be the moving force, and W $(tn-1):(n+t)$ the ſuſpending force, and Wt the force excluding friction.

EXAMPLE. If the weight be a ton, the friction $\frac{1}{3}$ of the preſſure; AB=5,

BC=3, and AC=4, then the moving force will be 3235 pounds; the ſuſpending force 747 pounds, and the force excluding friction 1680 pounds; nearly.

PROBLEM II.

Given the weight of the body, the inclination of the plane, and the ratio of the friction to the preſſure; to find the direction ſo that the ſuſtaining force may be a given quantity, or the leaſt poſſible.

Draw DQ and QP as before, and let PR be to Rm as the weight to the given force; then from the center R with a diſtance equal to Rm, interſect PQ in m; then Rm is the required direction when the force is given, but to have it the leaſt poſſible draw Rm at right angles to PQ, then Rm is the direction required.

COROLLARY 1. An expreſſion for the ſuſtaining force, when the leaſt poſſible, may be found as follows: in the triangles PDQ, RQm, the angle Q is common, therefore PQ : PD :: RQ : Rm; but PD is a fourth proportional to AB, AC, and PR, and DQ is to PD as 1 to n, ſuppoſing this the given ratio; alſo RD is a fourth proportional to AB, BC, and PR, conſequently RQ is equal to DQ either added to, or ſubtracted from, DR, as it is the firſt, or ſecond caſe; and becauſe PQ : PD :: $\sqrt{(nn+1)} : n$ :: RQ : Rm, therefore Rm = PR $(n.BC \pm AC) : AB\sqrt{(nn+1)}$ or $(ns \pm c\text{W} : (\sqrt{nn+1})$, by ſubſtituting s and c for the natural ſine and coſine of the plane's elevation, and uſing the negative or affirmative ſign as the force required, is, the moving or ſuſpending one reſpectively.

EXAMPLE. If AB=5, BC=3, and AC=4, and the weight 1 ton; then the leaſt moving and ſuſtaining forces will be 1825 and 702 pounds reſpectively.

COROLLARY 2. Becauſe the triangles PDQ and RQm are ſimilar, and the ratio of PD to DQ conſtant to each fixed value of n; therefore the angle QRm being equal to DPQ, will alſo be conſtant whether the inclination of the plane be variable or not; and hence the angles of the direction with the plane for the draught to be made with the greateſt advantage, are found for different values of n as follows:

n	QRm	n	QRm	n	QRm	n	QRm	n	QRm	n	QRm
	° ′		° ′		° ′		° ′		° ′		° ′
1	45.0	2	26.34	3	18.26	4	14. 2	5	11.19	6	9.28
1¼	38.40	2¼	23.58	3¼	16.54	4¼	13 15	5¼	10.47	7	8. 8
1½	33.41	2½	21.48	3½	15.57	4½	12 32	5½	10.18	8	7. 8
1¾	29.45	2¾	19.59	3¾	14.56	4¾	11.53	5¾	9 52	9	6.20

N. B.

N. B. The direction, or angle QRm, is to be taken below the plane for the ſuſpending, and above the plane for the moving force.

SCHOLIUM. Though at firſt ſight the former part of the above problem which ſhews the beſt method of applying an active force, ſeems ſuperior to the other, yet on farther conſideration the other appears of equal conſequence, and particularly in building and faſtening walls, banks of earth, and fortifications, &c. and the application of what are called *Land-ties*, &c. Thus if a weight, for inſtance, is to be drawn along the plane RB, and the friction be $\frac{1}{3}$ of the preſſure, the beſt direction is when Rm makes an angle of 18°.26′ *above* the plane; but if the weight is a quantity of earth or ſtone, or any thing to be ſuſpended, as in the caſe of land ties, the beſt angle (on the foregoing ſuppoſition) muſt be 18°.26′ *below* the plane.

SCHOLIUM.

In thoſe propoſitions the friction is eſtimated according to the moſt generally received opinion, that the reſiſtance is proportional to the whole preſſure compounded of the weight of the body, and the additional force neceſſary to overcome the friction; but it has been aſſerted that there may be caſes where the friction is not proportional to the whole preſſure, but to that which would ariſe if the body was ſuſtained in a given direction excluſive of friction; and that there might alſo be caſes, where the reſiſtance ariſing from tenacity or coheſion might be as the relative preſſure againſt the plane, and the force to overcome it the ſame in every direction; ſomething ſimilar to a globe ſtuck faſt in wet tenacious clay: I ſhall therefore give ſolutions to both caſes.

In the firſt caſe *, the force requiſite to ſuſtain the body in direction RV excluſive of friction is Rn; and as Rn is equivalent to RD and Dn, therefore Pn is the preſſure excluſive of friction; and as the friction is the n part of the preſſure, the force acting parallel to AB to overcome it is the n part of Pn; but the force which acting in direction Rn will be equivalent to the n part of Pn in the direction Rn, is a fourth proportional to n times RD, Pn, and Rn; but becauſe DQ is the n part of DP, therefore fn is the n part of Pn, and the fourth proportional aforeſaid will be nz; conſequently the ſum or difference of Rn and nz muſt be a given quantity, or the leaſt poſſible: the problem therefore is reduced † to drawing a line Rn from the given point R, meeting the two lines PD and PQ given in poſi-

* Fig. 3. † Fig. 4.

tion

tion in n and z, ſo that nz added to or taken from Rn, the ſum or difference may be a given quantity, or the leaſt poſſible. To do this, let DS be taken equal to DR, and draw Sr parallel to PD meeting PQ in M; then becauſe Rn is equal to rn, the ſum or difference of the quantities aforeſaid is rz; and when rz is required to be a given quantity, the queſtion is reduced to that particular caſe of the inclinations of *Appollonius*, in ſolids, which has been reſolved by *Newton* and *Barrow*; the limits of the problem or the mode of drawing the line Rr, ſo that the intercepted part rz may be the leaſt poſſible, may be inveſtigated as follows:

* Suppoſe it done, and Rrz the poſition required, and let Rnm be indefinitely near to Rz, and Mh perpendicular to Rz; then by applying the analyſis of the ancients to the *Newtonian* doctrine of prime and ultimate ratios, mn is equal to zr; and if from the center R with the diſtances Rz and Rn, the arcs zv and nt be ſuppoſed to be deſcribed, vn is equal to zt, and conſequently tr equal to mv; but rt : tn :: rh : Mh, and tn : zv :: Rr : Rz, and zv : vm :: Mh : hz, whence by compounding the proportions, tr : vm :: Rr . rh : Rz . zh, and as the two firſt terms are equal, the laſt are equal, and conſequently Rr : Rz :: zh : rh, and dividing Rr : rz :: zh : rz, therefore Rr is equal to zh, and conſequently the point h is in an hyperbola, whoſe aſymptotes are QM and SM produced: but becauſe the angle MhR is a right angle, the point h is alſo in the circumference of a circle, therefore a line drawn from R to h, the point where the hyperbola and circle interſect, is the poſition required.

In the other caſe, where the reſiſtance ariſing from tenacity or coheſion, is ſuppoſed to be as the relative preſſure againſt the plane, and the force to overcome it the ſame in each direction; we have Rn for the ſuſtaining force excluſive of friction; and the n part of Pn for the friction, and conſequently the ſum or difference of theſe is the expreſſion for the whole force; and the problem may be thus conſtructed. Take PD to DQ as the preſſure to the friction, and join PQ; on PD deſcribe a circle, in which take Dv equal to DQ; join Pv and draw RV perpendicular to it: then RV will repreſent the direction and meaſure of the whole force, when it is the leaſt poſſible.

For DQ and Dv are equal, and conſequently nf is equal to Vn; but DQ is the n part of DP, therefore nf or Vn is the n part of Pn, and conſequently RV is equal to the ſum or difference of Rn, and the n part of Pn; but RV is the leaſt poſſible by conſtruction, and therefore the other is a minium alſo. For draw any

* Fig. 6.

other

other line Rk meeting RV in k and PD in m; and draw mq, mt parallel to DQ and Dv; then the ſum or difference of Rm and mt is equal to the ſum or difference of Rm and mq; but the ſum or difference of Rm and mt is greater than RV, and therefore the ſum or difference of Rn, and the n part of Pn, is the leaſt poſſible.

PROBLEM III.

Given the weight of the body; the inclination of the plane, and the force ſuſtaining the body in a given direction; to find the ratio of the friction to the preſſure.

Take PR as before (ſee Fig. 1. 2.), draw Rm in the given direction, and take PR to Rm as the weight of the body to the force ſuſtaining it; draw Pm meeting AB in Q; and PD perpendicular to AB; then PD is to DQ as the preſſure to the friction.

PROBLEM IV.

If AhqN be the ſegment of an equilateral triangle, which by moving parallel to itſelf, and the horizon, generates a ſolid, upon which a figure hmGEHKpqh moves touching the former in hm and qp; required the effect of the friction; ſtill ſuppoſing it the n part of the preſſure.

Let P be the center of gravity of half the body *, and PR its weight as before; then the body, by means of its inflexibility, is kept together in the ſame manner as if it was actuated by a force parallel to the horizon; but if PDn be perpendicular to Ah, and Rn parallel to the horizontal line AC, meeting PD in n; Pn will be the preſſure againſt the ſide Ah, and the friction is the n part of Pn; but PR : Pn :: AC : AB, therefore if AC repreſent the weight of half the body, the n part of AB will expreſs the weight requiſite to overcome the friction for that half; and by doubling the expreſſions they ſerve for the whole: wherefore let W repreſent the weight of the body; f the ſecant of the angle BAC; then *Wf* will be the preſſure againſt the plane AD; and the n part of Wf the force neceſſary to overcome the friction; and as this laſt is the force neceſſary to draw the body along a horizontal plane, therefore the force neceſſary to draw the body along a horizontal plane, is to that neceſſary to draw it along the body whoſe ſection is AhqN, as AC to AB, or as 1 to *f*.

* Fig. 7.

Becauſe

Becauſe when the angle CAB is given, the ratio of PR to Pn is conſtant, therefore when the ſolid whoſe ſection is AhqN is elevated, making an angle with the horizon, ſo that its baſe forms an inclined plane; PR in that caſe repreſents the preſſure in a normal direction to that plane, and Pn the preſſure againſt the ſolid; and as the friction is increaſed in the ratio of the preſſure, therefore if the preſſure, which the body would have on the inclined plane, be increaſed in the ratio of AC to AB, or radius to the ſecant of the angle CAB, then the preſſure on the angular plane or body, whoſe perpendicular ſection is AhqN will be had, and conſequently its n part, or the friction. Hence this conſtruction *; let PR repreſent the weight; then PD at right angles to AB, repreſents the preſſure that the body would exert againſt the common inclined plane; take DK to DP as AB in the foregoing figure to AC, or as the ſecant of the inclination of the angular plane with its baſe to radius; let Dq be the n part of DK, and join Kq; then RM drawn any how to meet Kq in M, gives RM for the meaſure of the whole force in that direction; and it is the moving or ſuſpending force according as Dq is taken upwards or downwards in the line AB.

It is evident that Kq is parallel to PQ, and therefore though the leaſt force (which is perpendicular to Kq) differ from that in the former caſes; yet the directions for having the greateſt effect are ſtill the ſame as in the foregoing table: the demonſtration is in effect the ſame as the firſt.

COROLLARY. By ſuppoſing f to be the ſecant of the angle †, that the ſides of the angular plane make with the baſe; proceeding as Corollary 2d of Problem 1ſt, and putting t for the natural tangent of the plane's inclination, and W for PR the weight, we have $W(tn+f):(n-t)$ for the moving; and $W(tn-f):(n+t)$ for the ſuſpending force, neceſſary to draw the body along the angular inclined plane by a force acting parallel to the baſe of the plane.

EXAMPLE. Let AB, BC, and AC, be 5, 3, and 4 reſpectively, and let the inclination of the ſides be 45°; the weight of a ton and the friction one third of the preſſure; then 3648 pounds is the moving, and 499 the ſuſpending force.

SCHOLIUM.

In this propoſition, thoſe parts of the plane on which the body moves, are ſup-

* Fig. 5. † Fig. 8.

poſed

poſed rectilineal, as moſtly happens in practice; but the friction is eaſily eſtimated in curvilinear ſurfaces, and may be found generally as follows:

Let AMP * be half the ſection perpendicular to the horizon, and to the axis of the ſolid which forms the curvilineal plane on which the body is moved; AP the axis; PM the ordinate, and MS a tangent to the curve at the point M; alſo let RM repreſent the weight or preſſure in a direction perpendicular to the horizon at the point M; and let RF be perpendicular to MS meeting MP in F; alſo let PN be taken equal to MR, and PQ equal to RF; and ſuppoſe the ſame conſtruction to be made for every point of the curve, and let HN be the locus of all the points N, and GQ the locus of all the points Q; then will the friction when drawn along the horizontal plane, be to the friction of the ſame body when drawn along the curvilinear plane in the ſame direction, as the area APNH to the area APQG.

For the friction on the horizontal plane being as the ſum of the preſſures, is as the ſum of all the elementary lines MR or PN; that is, as the area AHNP; and the friction on the curvilinear plane is, for the ſame reaſon, as the ſum of all the RF or PQ, namely as the area APQG: hence the truth of the propoſition is manifeſt.

Corollary 1. Becauſe Mn or the fluxion of y is to Mm the fluxion of the curve, as MR or PN to RF or PQ, therefore if PN be a function of AP, PQ will be a fourth proportional to the fluxion of the ordinate, the fluxion of the curve AM, and this function; wherefore if the curves HN and AM be given; the nature of the curve GQ will be known, and its area may be found by the common methods of quadratures.

Corollary 2. It is evident, that when the planes are inclined to the horizon, the frictions of the right and curvilinear planes are ſtill in the ſame ratio as in the preceding caſes, and conſequently may be found by the ſame mode of proceeding.

Corollary 3. It is alſo evident, that the above method holds good whether the parts of the body are connected together or not, with reſpect to their motion in the direction RM, ſo long as each elementary part MR may be conſidered as ſuſtained at the point M by a force parallel to MP; but when the body is rigid or inflexible the caſe becomes more ſimple, for MR is then conſtant, and APNH becomes a parallelogram.

Corollary 4. By ſuppoſing given properties to exiſt in any two of the curves AM, HN, or GQ, the nature of the third will be known; and hence a number

* Fig. 9.

number of problems relative to friction, may be propoſed and reſolved by a proper application of the direct and inverſe methods of fluxions.

PROPOSITION 5. THEOREM.

In the application of forces to overcome friction, the ſame allowances muſt be made for the forces acting to advantage or diſadvantage by means of levers or other mechanical powers as are made in the common doctrine; for inſtance if a weight of two pounds, by acting at the diſtance of one foot from the fulcrum of a lever, be ſufficient to overcome the friction, then one pound at two feet diſtance will have the ſame effect, &c.

This is too evident to need a demonſtration.

OF FRICTION IN THE SCREW.

As any force acting perpendicular to the direction of a moving body does not affect the motion of the body in that direction; ſo the force acting perpendicular to the axis of the ſcrew, has no effect on the motion of a body raiſed thereby excluſive of friction; it therefore requires the ſame force to raiſe a body by means of a ſcrew, as to raiſe the ſame body in equal time along an inclined plane of the ſame elevation, as the threads of the ſcrew by means of a force acting parallel to the baſe of the inclined plane: now, if we ſuppoſe the weight ſo contracted or condenſed as to be capable of being placed on one of the threads of the ſcrew, and faſtened to an imaginary lever always perpendicular to its axis: then it is evident, this lever will have no effect but to change the direction of the weight, and keep it in the midſt of the thread of the ſcrew; and if a force be applied at the weight always perpendicular to this lever, ſo as to ſuſtain or draw it along, this force will be determined exactly the ſame as was done before in the inclined plane: but the rigidity of the parts of the "female ſcrew" ſerves exactly the ſame purpoſe as this imaginary lever, and makes the weight act upon the threads like a body ſuſtained on an inclined plane by a force parallel to its baſe; and as the force to overcome both the weight and the friction, is reciprocally as the diſtance from the center of the axis, therefore the diſtance of the power from the center of the axis, is to the diſtance from the ſame center to the middle of the threads of the ſcrew, as the force neceſſary to ſuſtain the body on the inclined plane, to the ſame force in the ſcrew at the diſtance of the power. The ſame proportion holds good whether the threads be cut perpendicular

to

to the axis or in an angle; for in the firſt, the common plane is to be taken, and in the ſecond, the inclined or angular one conſidered in the fourth propoſition: Wherefore if d be the diſtance from the center of the axis to the middle of the threads of the ſcrew; D the diſtance of the ſame center to the point where the force is applied; the force to overcome the weight and friction is $Wd\ (tn \pm f) : (n \mp t)$ D, where the letters expreſs the ſame things as before, and the upper ſign is for the moving, and the lower for the ſuſpending force. N. B. t is the natural tangent of the angle made by a line touching one of the threads, and a plane at right angles to the axis of the ſcrew; or it is equal to the diſtance of the reſpective edges of two threads, divided by the circumference of the cylinder, out of which the ſcrew is cut.

COROLLARY 1. When lines drawn from the center of the axis of the ſcrew to coincide with the threads, are at right angles to the axis, the above expreſſion becomes $Wd\ (t \pm n1) : (n \mp t)$ D, for f becomes radius or unity.

COROLLARY 2. When n is equal to t, the moving force will be infinite; alſo the ſuſpending force will be nothing when t is the n part of f; and when $Wd\ (tn - f) : (n \pm t)\ D$, becomes negative it expreſſes the quantity of force, which muſt act in a contrary direction to reduce the body juſt to a ſtate of ſuſpenſion.

SCHOLIUM.

It would be needleſs to make any allowance for the curvilinear ſurfaces of the threads of ſcrews, as they ſeldom differ much from the two foregoing forms; neither is it of much conſequence to allow for their parts being at different diſtances from the axis, as their breadth ſeldom bears any conſiderable ratio to the length of the levers by which they act; but the caſe is different when large bodies revolve on each other, and therefore it will be neceſſary to ſhew the mode of proceeding in ſuch caſes.

Let MmAQ be a convex ſolid generated by the revolution of the curve MAQ, about its axis perpendicular to the horizon; and MRSQ a concave body exactly fitting it; then if this laſt body be revolved about the axis AP by means of the lever Pf, the force neceſſary to overcome the friction of one body turning upon the other may be found as follows: ſuppoſe the revolving body divided into an infinite number of concentric tubes, that may deſcend independent of each other, and preſs freely againſt the body on which they revolve, and yet be ſo connected that the lever Pf,

* Fig. 10.

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may give the ſame angular velocity at the ſame time to each; alſo let the ordinates PN of the curve HN, repreſent the weight or preſſure (in a direction perpendicular to the horizon) of each of the indefinitely ſmall parts Mk, or elementary lines of the body at the diſtance PM from the axis; and let c be the circumference of a circle whoſe radius is unity: Then, becauſe the friction of each of the elementary tubes MRSQ is as its preſſure; and the preſſure is as the number of lines Mk and the preſſure of each; therefore as this number is as PM.Mn.c, we have the n part of this expreſſion for the force which acting at M would overcome the friction of the cylindrical tube, if moved round upon a horizontal plane; but as the preſſure of each elementary part is increaſed in the ratio of Mn to Mm, when moved on the the ſolid MAQ, the real force will be (PM.c.Mm.PN) : n; Alſo Pf : PM :: (PM.c. Mm.PN) : n to the ſmall elementary force which will overcome the laſt force when acting at f; conſequently the whole force will be equal to the fluent of (PM^2.PN. Mm.c) : (n.Pf).

COROLLARY. By means of the curves AM, HN, &c. concluſions may be drawn ſimilar to thoſe in the corollaries to the ſcholium of the fourth propoſition.

OF FRICTION IN THE LEVER.

It has been already obſerved, that a force acting perpendicular to the direction of a body, in motion does not alter the body's motion in that direction; therefore if * we ſuppoſe DB to be an upright cylinder, and AB a body touching it in a line as in the figure, and retained cloſe to it by an imaginary force drawing it perpendicular towards the axis: then if a force CP be applied to C, the center of gravity of AB, and be always ſuppoſed to act perpendicularly to the radius CN drawn from the center of the axis to the point C, the friction will be the ſame in drawing the body round the cylinder, as in drawing it along a horizontal plane with an equal preſſure; and if it be moved round by a force acting at a greater diſtance, the force will be reciprocally as the diſtance; on the contrary, if the body AB be fixed, and the cylinder turned round about its axis, the friction will be the ſame as if the cylinder was fixed, and the body drawn round it by CP as before: Likewiſe the friction is the ſame, whether the cylinder be fixed and the body AB moved round the axis MR by a force Qc applied at c; or whether the point c be fixed with AB faſtened to Cc, and the cylinder be revolved in a circle whoſe center is c, ſo as always to retain its paralleliſm with reſpect to any fixt object; and as this laſt caſe obtains in all the axletrees of carriages, ſince every point of the wheel's contact with the ground

* Fig. 11.

may

may be conſidered as the center of motion for that inſtant, therefore the effect of the reſiſtance ariſing from the friction of the concave part of the nave upon the axletree, is to the effect that would ariſe from drawing the ſame weight over a horizontal plane of the ſame kind as the parts that rub each other, as the radius of the axis, to the radius of the wheel: It muſt be obſerved that this is not the only friction to which carriages are ſubject, for there is another part ariſing from the coheſion of the wheel and the ground at their contact, which is to be found and allowed for by the three firſt propoſitions.

In the above, the preſſure and friction have been ſuppoſed to be as the weight, as it is on a horizontal plane; but by the ſcholium to the fourth propoſition, it is plain that the preſſure is greater than the weight, and may be ſo in any proportion; however, as it appears by calculation that the preſſure on an arc of ninety degrees is to that on its chord only as 1,183 to 1, when both the concave and convex parts have exactly the ſame curvature; the difference will be ſo trifling, when the cylinders have different curvatures as uſual, as to require very ſeldom to be allowed for.

This being premiſed, let M * be a weight placed at the point A of a lever moveable about an axis whoſe center is d and radius dn; and let N be the ſuſtaining force acting at B: Now it is evident that the preſſure on the axis d, differs ſo little from the weight, that it may be ſafely taken for it without any conſiderable error, except in ſome remarkable caſes which may be allowed for from what has been ſaid already; and therefore the friction which ought in ſtrictneſs to be taken as the n part of the preſſure, will here be taken as the n part of the weight upon the axis: Now if N be taken for the force which acting at B would be juſt ſufficient to keep the weight M at A, in equilibrio, excluſive of friction; and if W be the additional force to be added to N ſo as to overcome the friction; then will M+P, M−P, and P−M, be the weight upon the axis at d in the firſt, ſecond, and third figures reſpectively (ſuppoſing the ſum of M and N to be equal to P)‡; now as the friction is the n part of each of theſe quantities, and its effect is to keep the lever in a ſtate of reſt; therefore in whatever direction the force at N endeavours to draw the lever by acting at B, the friction tends to counteract that force by keeping the lever ſteady or acting in a contrary direction at n; and as the effect of the friction, and the additional force W, are in equilibrio; and the friction acts by means of the lever dn, and the force W by the lever dB; therefore Bd is to dn, as the ſum or difference of the n part of $N+W$ and M, is to W; conſequently $W=dn\ (M+N) : (n.Bd-dn)$, in the

‡ Fig. 12, 13, 14.

firſt

firſt figure; $W=dn\,(M-N):(n.Bd+dn)$, in the ſecond figure; and in the third figure, $W=d\,(N-M):(n.Bd-dn)$: all theſe are the expreſſions for the moving forces.

To find the ſuſpending forces, or the forces which acting at N ſhall be juſt ſufficient to prevent the weight M from deſcending: Let M and N be the ſame as before, and let w be the force which taken from N, will leave a force juſt ſufficient to prevent M from deſcending; then the weight upon d, in the firſt figure will be $M+N-w$; in the ſecond figure, the weight will be $M-N+w$; and in the third figure, $N-M-w$; and by proceeding as before, the values of w in the ſuſpending forces, are $dn\,(M+N):(n.Bd+dn)$; $dn(M-N):(n.Bd-dn)$, and $dn(N-M):(n.Bd+dn)$, in the firſt, ſecond, and third figures, reſpectively.

Becauſe Bd:dA::M:N, therefore if this value of N be ſubſtituted in each of the above expreſſions for the friction; the whole force capable of ſuſtaining the friction and weight M will be had: thus for example, the moving force to overcome the friction and weight M in the firſt figure, will be $M\,(n.dA+dn):(n.Bd-dn)$, and the ſuſpending force $M\,(n.dA-dn):(n.Bd+dn)$, in the ſecond figure, the moving force will be $M\,(n.dA+dn):(n.Bd+dn)$, and the ſuſpending force $M\,(n.dA-dn):(n.Bd-dn)$; and in the third figure, the moving force will be $M\,(n.dA-dn):(n.Bd-dn)$, and the ſuſpending force will be $M\,(n.dA+dn):(n.Bd+dn)$.

The method of finding n from each of the above equations is evident, and conſequently the ratio of the friction to the preſſure by experiments.

ON FRICTION IN THE WEDGE.

Let AC * be the force neceſſary to ſuſtain the wedge QPB in the direction aB perpendicular to QP, friction included; and let AB be the force excluſive of friction: draw AN and AH perpendicular to the BQ and BP; CG parallel to AN, and CF parallel to AH: Now GA and AF, the forces of the wood againſt the ſide of the wedge, in thoſe directions, compound a force equivalent to the diagonal CA in the direction CA, and therefore a force repreſented by AC in that direction, muſt be applied to the head of the wedge at a to overcome theſe forces: Let gr be the n part of Ag, and let the lines Ar be drawn, and alſo GK and FZ perpendicular to AG and AF meeting the lines Ar in K and Z; then will GK and FZ repreſent the friction againſt the ſides BP and BQ, being each the n part of AG and AF, the preſſure againſt each ſide, reſpectively; wherefore if Be be taken in PB, and Bn in

* Fig. 15.

BQ,

BQ, equal to GK and FZ reſpectively, the forces Be and Bn in thoſe directions muſt compound a force to which the force BC in the direction BC muſt be equivalent, and conſequently if Bm be the force compounded of Be and Bn; and Cm be joined, Cm muſt be perpendicular to mB; ſince Be or GK is the force of friction ariſing from the preſſure againſt BP, which tends to prevent the wedge from moving either in the direction BP or PB; and Bn or FZ has a ſimilar effect with reſpect to the direction in the line BQ; and by hypotheſis BC is juſt ſufficient to balance theſe forces: It is alſo evident from what was ſaid concerning the inclined plane, that Be and Bn muſt be taken in the directions PB and QB for the moving force, but in the directions BP and BQ for the ſuſpending force.

The method of calculation is evident; for as aB, AG, and AF, are perpendicular to QP, BP, and BQ, the triangles QPB and CAG are ſimilar, and the parallelogram Bnme ſimilar to FAGC; whence by ſuppoſing certain parts given, the reſt may be found, &c.

COROLLARY. When the wedge is iſoſceles the point m falls on C, and Be is equal to Bn, and therefore Be or GK is equal to (AB+BC)PB) : (n.QP); but PB : Ba :: 2Be : BC, and therefore BC=2Ba (AB+BC) : (n.QP) or equal to (2Ba.BA) : (n. QP − 2Ba), and therefore AC=(n.QP.AB) : (n.QP − 2Ba), and by following the ſame method for the ſuſpending force, we find BC=(2Ba.AB) : (n.QP+2Ba), and conſequently AC is equal to (n.QP.AB) : (n.QP+2Ba).

SCHOLIUM.

By proceeding in a ſimilar method, the forces of the arch-ſtones of bridges, &c. may be determined; for let QbbP be a ſtone ſuſtained by the parts of the arch preſſing againſt Pb and Qb, and let A be its center of gravity, and AB perpendicular to the horizon; alſo let AB and AC be the ſame as before: then becauſe the body is in equilibrio, the force in direction AC will be equivalent to the force in a contrary direction, ariſing from the preſſures againſt the body in the directions GA and KA, together with the force of friction; and becauſe the preſſures are AG and AK, if Be (the n part of AG) be drawn parallel to PB; and Bn (the n part of AK) be drawn parallel to Qb; and the parallelogram Bnme be completed, and Cm joined; Bm will be the force ariſing from friction, and the angle BmC a right angle; the adjacent figure * is for the moving force, but the method is ſimilar for the ſuſpenſive force; and it is evident that the one conſtruction is of uſe to determine the

* Fig. 15.

force

force which tends to break an arch by preſſing it downwards, and the other, the force that tends to break it upwards.

But as that excellent mathematician P. FRISI in his *Inſtituzioni di Meccanica*, has objected to the diviſion of the force AB into the forces AN and AH, and thence concluded BELIDOR and COUPLET to have been miſtaken on that account in their writings upon bridges; I ſhall, therefore, prove that the common method is really a conſequence of what that gentleman himſelf allows, and that his objections are not well founded. In the firſt place he allows the force AB to be equivalent to the forces AV and AD or VB; now (excluding friction) if that part of the arch which touches Pb was removed, it is evident QbbP would immediately begin to deſcend along Qb with a force repreſented by VB or AD; but this deſcent is prevented by that part of the arch which touches Pb, and therefore the force of that arch in the direction HA, muſt be ſuch as to be equivalent to DA in the direction DA or BV; but no force greater or leſs than HA will be equivalent to DA in the direction DA, and therefore HA is the real preſſure or force againſt Pb: again, HD is the preſſure in a perpendicular direction to Qb ariſing from this force; and as AV is the preſſure againſt Qb ariſing from the force AB, therefore AV together with HD is the whole preſſure againſt Qb in the direction AV; but becauſe the body is in equilibrio, and conſequently the action or force in the direction AV equal to the reaction in a contrary direction; therefore AV+HD or AN (becauſe NV is equal to HD by the property of the parallelogram) repreſents the preſſure againſt Qb, and AH the preſſure againſt Pb; which is contrary to what P. FRISI aſſerts, and agreeable to the uſual method.

The ſame learned Author has made another very material miſtake from a ſimilar cauſe at page 67 of the aforeſaid treatiſe, relative to the tenſion of ropes; which cannot be attributed to haſte or inadvertency, as he expreſsly aſſerts the holders of the common opinion to be miſtaken, in conſequence of their uſing the theory of compoſition of forces without ſufficient precaution: I ſhall therefore, after giving his own words, take the liberty of ſhewing where I apprehend he is miſtaken.

" Parleremo più a lungo delle altre ricerche matematiche, alle quali ha dato occaſione la controverſia inſorta intorno alla cupola di S. Pietro. Coll' occaſione che ſi è diſcorſo in Milano di munire la fabbricca del Duomo di un Conduttore elettrico, che dalla cima dell' aguglia ſi dirimaſſe, e ſcendeſſe per differenti parti del tempio, ſi è ancora parlato dell azione, che i fili del Conduttore potrebbero eſercitare contra l'aguglia, e ſi ſono propoſti varj Problemi intorno alle tenſioni delle funi. Io qui aggiu-

aggiugnerò le ſoluzioni, che ho ritrovato, e incommincierò dalla prima riſoluzione delle forze tendenti, la quale ſiccome é interamente differente da quella, que hanno ſeguitato altri Autori, coſi non ſará meravaglia che porti dei riſultati interamente differenti da quelli che ſono ſtati ſinora publicati. Penda il * filo QVR, dai punti Q,edR, e vi ſi attacchi in V il peſo P. ſi produca la verticale PV in A; ſi eſprima il peſo P colla retta AV, e dal punto A; ſi tirino ſopra QV, RV le perpendicolari AM, AN. Sara MV l'intera forza eſercitata ſecondo QV, ed NV ſará quella che ſi eſerciterá ſecondo RV.

" La ſteſſa coſa ſi dedurrebbe riſolvendo la forza AV nelle due Aq, Ar parallele ai fili QV, RV, e poi riſolvendo di nuovo la forza Aq nelle due AN, Nq, e ſimilmente la Ar in due altre AM, Mr. Mentre conqueſte riſoluzioni é manifeſto che la forza totale eſercitata nel tendere il filo QV dev'eſſere Aq—Mr=rV—Mr=MV, e la tenſione del filo RV=Vq—Nq=NV.

" S'ingannerebbe chi miſuraſſe ſeparatamente la tenſione del filo QV dalla forza Aq, oſſia rV, e la tenſione di RV da Ar, oppure da qV. Egli è vero, che le due tenſioni equivalgono inſieme come alla ſola forza AV, così ancora alle due Ar, Aq, oppure alle quattro inſieme AN, Nq, AM, Mr. ma nel prendere le tenſioni ſeparate biſogna in oltre avvertire, che quando l'angolo QVR non è retto, una porzione di Aq agiſce ſecondo RV, ed una porzione di Ar ſecondo QV: e ſeparando le azioni ſara MV, la tenſione del filo QV, ed NV quella di RV."

In the firſt place I ſhall demonſtrate the truth of the eſtabliſhed method from principles that FRISI has himſelf allowed; and ſecondly, point out the abſurdity of his concluſions.

1. Let Vn and Sr be parallel to AN; then becauſe NVn is a right angle, and the force VA may be reſolved into VN and Vn, in thoſe directions, therefore if RV and VP were to remain in the ſame poſition, and the force which now keeps the body ſuſpended by acting in the direction VQ, was to act in the direction Vn with a force expreſſed by Vn; it is then granted that the equilibrium would ſtill be maintained, and the tenſions would be as Vn and VN; and therefore as no force VS whatever acting at V in the direction RV, can have any effect in the direction Vn perpendicular to RV, it neceſſarily follows that the force in any other direction VQ muſt be ſuch as to be equivalent to Vn in the direction Vn; but it is likewiſe granted that no other force but Vr in the direction VQ can be equivalent to Vn in

* Fig. 17.

the

the direction Vn; and as the force Vr is equivalent to Vn and VS; and as VS, or its equal qN, only gives an additional tenſion to NV, the tenſion which the cord RV was ſuppoſed to have before, which whole tenſion is equal to the reaction of the tack R; therefore qV is the tenſion of the cord RV, and Vr that of Qv.

2. Let the points Q and R coincide, and RV, QV, and VP, will then be perpendicular to the horizon; and if VQ or VR be aſſumed to expreſs the weight P; then will the points A, R, Q, M, and N coincide; and according to FRISI's principle, the tenſions of RV, VQ, and VP, will be equal; but from the well known principle of the pulley, each cord VQ and VR bears but half the weight P, and therefore this abſurdity follows, that a cord is as much ſtretched with half the weight as it would with the whole.

Again, if the points R, V, and Q, be ſuppoſed horizontal, it follows from the common theory that the tenſion of the rope RVQ would be infinite; but VN and VM vaniſh when RVQ is horizontal, and therefore by FRISI's principle, the tenſion in that caſe would be nothing at all; but it is well known from the moſt common experiments to be very conſiderable, even when RQV is but nearly horizontal, and therefore the new theory of this great mathematician is indefenſible.

REMARK. All the foregoing except the laſt ſcholium, was written in 1775, before the author had ſeen any thing to ſpeak of on the ſubject; he had deſigned, and executed great part of an extenſive treatiſe on friction according to different hypotheſes; but as no body would be at the riſk of publiſhing it, and he could not afford it himſelf, the moſt of it was accidentally loſt; what is here given is an extract only of ſome of the firſt part, where velocity was not taken into the account, and where there were no complicated algebraic or fluxional expreſſions which would be difficult to print in this country.

TO

TO THE HONOURABLE SIR WILLIAM JONES,

Preſident of the Aſiatick Society.

SIR,

I HAVE the honour to obey the orders of the Honourable the Governor General and Council, in tranſmitting to you, for the information of the *Aſiatick Society*, an extract of a letter addreſſed to the Governor General, on the 2d of laſt month, by Lieutenant SAMUEL TURNER, who was appointed on an embaſſy to *Tibet*, and a copy of an account encloſed in it of Mr. TURNER's interview with TEESHOO LAMA, at the Monaſtery at *Terpaling*.

I have the honour to be, with great reſpect,
Sir,
Your moſt obedient and moſt humble ſervant,
E. HAY, *Secretary*.

COUNCIL CHAMBER,
Politicdl Department, *April* 13, 1784.

EXTRACT OF A LETTER FROM MR. SAMUEL TURNER TO THE HONOURABLE THE GOVERNOR GENERAL, DATED PATNA, 2d MARCH, 1784.

DURING my reſidence in *Tibet*, it was an object I had much at heart to obtain an interview of the infant TEESHO LAMA, but the emperor of *China*'s general orders, reſtricting his guardians to keep him in the ſtricteſt privacy, and prohibiting indiſcriminately the admiſſion of all perſons to his preſence, even his votaries, who ſhould come from a diſtance, appeared to me an obſtacle almoſt inſurmountable; yet, however, the Rajah, mindful of the amity ſubſiſting between the Governor and him, and unwilling, I believe, by any act to hazard its interruption, at length conſented to grant me that indulgence. As the meeting was attended with very ſingular and ſtriking circumſtances, I could not help noting them with moſt particular

attention; and though the repetition of ſuch facts, interwoven and blended as they are with ſuperſtition, may expoſe me to the imputation of extravagance and exaggeration, yet I ſhould think myſelf reprehenſible to ſuppreſs them; and while I diveſt myſelf of all prejudice and aſſume the part of a faithful narrator, I hope, however tedious the detail I propoſe to enter into may be found, it will be received with candour, and merit the attention of thoſe for whoſe peruſal and information it is intended, were it only to mark a ſtrong feature in the national character, of implicit homage to the great religious ſovereign, and to inſtance the very uncommon, I may ſay almoſt unheard of, effects of early tuition.

I ſhall, perhaps, be ſtill more juſtified in making this relation, by adverting to that very extraordinary aſſurance, the Rajah of *Teeſhoo Loomboo* made me but a few days before my departure from his court, which, without further introduction, I will beg leave literally to recite.

At an interview he allowed me, after having given me my audience of leave, ſaid he, "I had yeſterday a viſion of our tutelary deity, and to me it was a day "replete with much intereſting and important matter. This guardian power, who "inſpires us with his illuminations on every momentous and great occaſion, in-"dulged me with a divination, from which I have collected that every thing will be "well; ſet your heart at reſt, for though a ſeparation is about to take place between "us, yet our friendſhip will not ceaſe to exiſt; but through the favour of inter-"poſing providence you may reſt aſſured it will encreaſe, and terminate eventually "in that which will be for the beſt."

I ſhould have paid leſs regard to ſo ſtrange an obſervation but for this reaſon, that however diſſonant from other doctrines their poſitions may be found, yet I judge they are the beſt foundation to build our reliances upon, and ſuperſtition combining with inclination to implant ſuch friendly ſentiments in their minds will ever conſtitute, the opinion having once obtained, the ſtrongeſt barrier to their preſervation. Oppoſed to the prejudices of a people, no plan can reaſonably be expected to take place: agreeing with them, ſucceſs muſt be the reſult.

A true extract,

E. HAY, *Secretary to the Governor General and Council.*

COPY

VII.

COPY OF AN ACCOUNT GIVEN BY MR. TURNER OF HIS INTERVIEW WITH TEESHOO LAMA AT THE MONASTERY OF TERPALING, ENCLOSED IN MR. TURNER'S LETTER TO THE HONOURABLE THE GOVERNOR GENERAL, DATED PATNA, 2d MARCH, 1784.

ON the 3d of December, 1783, I arrived at *Terpaling*, ſituated on the ſummit of a high hill, and it was about noon when I entered the gates of the Monaſtery, which was not long ſince erected for the reception and education of TEESHOO LAMA. He reſides in a palace in the center of the Monaſtery, which occupies about a mile of ground in circumference, and the whole is encompaſſed by a wall. The ſeveral buildings ſerve for the accommodation of three hundred *Gylongs* appointed to perform religious ſervice with TEESHOO LAMA, until he ſhall be removed to the Monaſtery and Muſnud of *Teeſhoo Loomboo*. It is unuſual to make viſits either here or in *Bootan* on the day of arrival: we therefore reſted this day, only receiving and ſending meſſages of compliment.

On the 4th in the morning, I was allowed to viſit TEESHOO LAMA, and found him placed in great form upon his Muſnud; on the left ſide ſtood his father and mother, on the other the officer particularly appointed to wait upon his perſon. The Muſnud is a fabrick of ſilk cuſhions piled one upon the other until the ſeat is elevated to the height of four feet from the floor; an embroidered ſilk covered the top, and the ſides were decorated with pieces of ſilk of various colours ſuſpended from the upper edge and hanging down. By the particular requeſt of of TEESHOO LAMA'S father, Mr. SAUNDERS and myſelf wore the *Engliſh* dreſs.

I advanced, and, as is the cuſtom, preſented a white pelong handkerchief, and delivered alſo into the LAMA'S hands the Governor's preſent of a ſtring of pearls and coral, while the other things were ſet down before him. Having performed the ceremony of the exchange of handkerchiefs with his father and mother, we took our ſeats on the right of TEESHOO LAMA.

A multitude of perſons, all thoſe ordered to eſcort me, were admitted to his preſence

preſence and allowed to make their proſtrations. The infant LAMA turned towards them, and received them all with a chearful and ſignificant look of complacency. His father then addreſſed me in the *Tibet* language, which was explained to me by the interpreter, that TEESHOO LAMA had been uſed to remain at reſt until this time of the day, but he had awoke very early this morning, and could not be prevailed on to remain longer in bed, for, added he, "the *Engliſh* Gentle-"men were arrived, and he could not ſleep." During the time we were in the room, I obſerved the LAMA'S eyes were ſcarce ever turned from us, and when our cups were empty of tea, he appeared uneaſy, and throwing back his head and contracting the ſkin of his brow, he kept making a noiſe, for he could not ſpeak, until they were filled again. He took out of a golden cup, containing confects, ſome burnt ſugar, and ſtretching out his arm made a motion to his attendants to give them to me. He then ſent ſome in like manner to Mr. SAUNDERS, who was with me. I found myſelf, though viſiting an infant, under the neceſſity of ſaying ſomething, for it was hinted to me, that notwithſtanding he is unable to reply, it is not to be inferred that he cannot underſtand. However, his incapacity of anſwering excuſed me many words, and I juſt briefly ſaid, That the Governor General on receiving the news of his deceaſe in *China*, was overwhelmed with grief and ſorrow, and continued to lament his abſence from the world until the cloud that had overcaſt the happineſs of this nation by his re-appearance was diſpelled, and then, if poſſible, a greater degree of joy had taken place than he had experienced of grief on receiving the firſt mournful news. The Governor wiſhed he might long continue to illumine the world with his preſence, and was hopeful that the friendſhip which had formerly ſubſiſted between them would not be diminiſhed, but rather that it might become ſtill greater than before, and that by his continuing to ſhew kindneſs to my countrymen, there might be an extenſive communication between his votaries, and the dependants of the *Britiſh* nation. The little creature turned, looking ſteadfaſtly towards me with the appearance of much attention while I ſpoke, and nodded with repeated, but ſlow movements of the head, as though he underſtood and approved every word, but could not utter a reply. The parents, who ſtood by all the time, eyed their ſon with a look of affection, and a ſmile expreſſive of heartfelt joy at the propriety of the young LAMA'S conduct. His whole regard was turned to us; he was ſilent and ſedate, never once looking towards his parents, as if under their influence at the time; and with whatever pains his manners may

have

have been formed ſo correct, yet I muſt own his behaviour on this occaſion appeared perfectly natural and ſpontaneous, and not directed by any action or ſign of authority.

The ſcene in which I was here brought to take a part was too new and extraordinary, however trivial, if not abſurd, as it may appear to ſome, not to claim from me great attention and conſequently minute remark.

TEESHOO LAMA is at this time about 18 months of age. He did not ſpeak a word, but made moſt expreſſive ſigns, and conducted himſelf with aſtoniſhing dignity and decorum. His complexion is of that hue which in *England* we ſhould term rather brown, but not without colour. His features good—ſmall black eyes—an animated expreſſion of countenance—and altogether I thought him one of the handſomeſt children I had ever ſeen. I had but little converſation with the father. He told me he had directions to entertain me three days on account of TEESHOO LAMA, and entreated me with ſo much earneſtneſs to paſs another on his own account, that I could not reſiſt complying with his requeſt. He then invited us for to-morrow to an entertainment he propoſed to make at a ſmall diſtance from the Monaſtery, which invitation having accepted, we took our leave and retired.

In the courſe of the afternoon I was viſited by two officers of the LAMA's houſehold, both of whom are immediately attendant on his perſon. They ſat and converſed with me ſome time, enquired after Mr. BOGLE, whom both of them had ſeen; and then remarking how extremely fortunate it was the young LAMA's having regarded us with very particular notice, obſerved on the very ſtrong partiality of the former TEESHOO LAMA for the *Engliſh*, and that the preſent one often tried to utter the name of the *Engliſh*. I encouraged the thought, hopeful that they would teach the prejudice to ſtrengthen with his encreaſing age, and they aſſured me that ſhould he, when he begins to ſpeak, have forgot, they would early teach him to repeat the name of HASTINGS.

On the morning of the 6th, I again waited on TEESHOO LAMA to preſent ſome curioſities I had brought for him from *Bengal*. He was very much ſtruck with a ſmall clock, and had it held to him, watching for a long time the revolutions of the moment hand; he admired it, but with gravity and without any childiſh emotion. There was nothing in the ceremony different from the firſt day's viſit. The father and mother were preſent. I ſtaid about half an hour, and retired to return and take leave in the afternoon.

The votaries of TEESHOO LAMA already begin to flock in numbers to pay their adorations

adorations to him. Few are yet admitted to his preſence. Thoſe who come eſteem it a happineſs if he is but ſhewn to them from the window, and they are able to make their proſtrations before he is removed. There came to-day a party of *Kilmaaks (Calmuc Tartars)* for purpoſes of devotion and to make their offerings to the LAMA. When I returned from viſiting him, I ſaw them ſtanding at the entrance of the ſquare in front of the palace, each with his cap off, his hands being placed together elevated, and held even with his face. They remained upwards of half an hour in this attitude, their eyes fixed upon the apartment of the LAMA, and anxiety very viſibly depicted in their countenances. At length, I imagine, he appeared to them, for they began altogether by lifting their hands, ſtill cloſed, above their heads, then bringing them even with their faces, and after lowering them to their breaſts, then ſeparating them: to aſſiſt them in ſinking and riſing, they dropt upon their knees and ſtruck their heads againſt the ground. This with the ſame motions was repeated nine times. They afterwards advanced to deliver their preſents, conſiſting of talents of gold and ſilver, with the products of their country, to the proper officer, who having received them, they retired apparently with much ſatisfaction.

Upon enquiry I learnt that offerings made in this manner are by no means unfrequent, and in reality conſtitute one of the moſt copious ſources from which the LAMAS of *Tibet* derive their wealth.

No one thinks himſelf degraded by performing theſe humiliations. The perſons I allude to who came for this devout purpoſe, were attendant on a man of ſuperior rank, that ſeemed to be more engroſſed than the reſt in the performance of the ceremony. He wore a rich ſatin garment lined with fox ſkins, and a cap with a toſſel of ſcarlet ſilk flowing from the centre of the crown upon the ſides all round, and edged with a broad band of *Siberian* fur.

According to appointment I went in the afternoon to make my laſt viſit to TEESHOO LAMA. I received his diſpatches for the Governor General, and from his parents two pieces of ſatin for the Governor, with many compliments.

They preſented me with a veſt lined with lambſkins, making many aſſurances of a long remembrance, and obſerving that at this time TEESHOO LAMA is an infant and incapable of converſing, but they hoped to ſee me again when he ſhall have become of age. I replied that by favour of the LAMA I might again viſit this country, I looked forward with anxiety to the time when he ſhould mount the Muſnud, and ſhould then be extremely happy in the opportunity of paying my reſpects.

reſpects. After ſome expreſſions and proteſtations of mutual regard, my viſit was concluded: I received the handkerchiefs and took my leave: and am to purſue my journey towards *Bengal* to-morrow at the dawn of day.

(Signed) SAMUEL TURNER.

A true Copy,

E. HAY, *Secretary to the Governor General and Council.*

To SIR WILLIAM JONES, KNIGHT,

Preſident of the Aſiatick Society.

SIR,

THE Honourable the Governor General having received and laid before the Board a Letter addreſſed to him by Lieutenant SAMUEL TURNER, containing the Account of a Journey made to *Teeſhoo Loomboo* by a *Goſſeyn* named POORUNGEER, and the circumſtances of his reception by TEESHOO LAMA; and the Board deeming it worthy of the attention of the *Aſiatick Society*, I have the honour, in obedience to their directions, to tranſmit to you a copy of it.

I have the honour to be,

Sir,

Your moſt obedient humble Servant,

E. HAY, *Secretary.*

FORT WILLIAM,

Secret Department, Feb. 22, 1786.

VIII.

AN ACCOUNT OF A JOURNEY TO TIBET.

TO THE HONOURABLE JOHN MACPHERSON, Esq.

GOVERNOR GENERAL, *&c. &c. &c.*

Fort William.

HONOURABLE SIR,

HAVING, in obedience to the inſtructions with which you were pleaſed to honour me, examined POORUNGEER, the *Goſſeyn*, who has at different times been employed in deputations to the late TEESHOO LAMA, formerly accompanied him to the court of *Pekin*, and who is lately again returned from *Tibet*, and having collected from him ſuch an account of the journey he has juſt performed, and other information as he could give me relative to the countries he has left; I beg leave to ſubmit it to you in the following narrative.

In the beginning of laſt year POORUNGEER, having received diſpatches from Mr. HASTINGS, a ſhort time previous to his departure from *Bengal*, for TESHOO LAMA and the Regent of *Teſhoo Loomboo*, immediately ſet about preparing for the diſtant journey he had engaged to undertake which employed him until the beginning of the following month of March, when I beg leave to recal to your remembrance I had the honour to preſent him to you for his diſmiſſion. He then commenced his journey from *Calcutta*, and early in the month of April had paſſed, as he relates, the limits of the Company's Provinces, and entered the mountains that conſtitute the kingdom of *Bootan*, where, in the proſecution of his journey, he received from the ſubjects of the DAIB RAJA, the moſt ample and voluntary aſſiſtance to the frontier of his territory, nor met with any impediment to oppoſe his progreſs until he came upon the borders of *Tibet*. Here he was compelled to halt for near a fortnight by a heavy fall of ſnow, that commenced upon his arrival, and continued inceſſantly for the ſpace of ſix days, covering the face of the country to ſo great a depth as totally to put a ſtop to all travelling, and render it impracticable for him to proceed until a thaw ſucceeded to open the communication. During the time

of

of his confinement at *Phari*, he ſays, ſuch was the ſeverity of the cold, and the injurious effect ſo rapid a tranſition from a temperate climate had on the health of himſelf and his companions, that it left him little room to doubt if an early change had not fortunately taken place and permitted his advance, that they muſt all have fallen victims to the inclemency of the weather.

However, as early as it was poſſible for him to leave *Phari*, he proceeded by long ſtages on his journey, and without encountering any further difficulty, on the 8th of May following, reached *Teſhoo Loomboo*, the capital of *Tibet*. Immediately upon entering the Monaſtery, he went to the Durbar of the Regent PUNJUR INTINNEE NEMOHEIN to announce his arrival and the purpoſe of his commiſſion. Quarters were then allotted for his reſidence, and an hour fixed for him to wait upon TESHOO LAMA; who he was informed the following morning intended to leave the palace to occupy one of his gardens, ſituated on the plain within ſight of the Monaſtery, where it was viſible a conſiderable encampment had been formed. The LAMA quitted his apartment at the firſt dawn of day, and was lodged in the tents pitched for his accommodation before the ſun had riſen.

In the courſe of the morning, at the hour appointed for his admiſſion, POORUNGEER went down to the LAMA's tents. He heard, on entering the gates of the encloſure, that the young LAMA was taking his recreation in the garden, ranging about, which became with him a very favourite amuſement. As it was at this time in *Tibet* the warmeſt part of the year, that he might enjoy the benefit of the air, his attendants had choſen a ſpot where the trees afforded a complete ſhade to place an elevated ſeat of cuſhions, for the young LAMA, after his exerciſe, to reſt upon. In this ſituation POORUNGEER found him, when ſummoned to his preſence, attended by the Regent, his parents, SOOPOON CHOOMBOO, the cup bearer, and the principal officers of the court. After making three obeiſances at as remote a diſtance as it was poſſible, POORUNGEER approached, and preſented to the LAMA, according to the cuſtom of *Tibet*, a piece of white pelong, and then delivered the letters and preſents with which he had been charged. The packages were all immediately opened before the LAMA, who had every article brought near to him, and viewed them ſeparately one by one. The letter he took into his own hand, himſelf broke the ſeal, and taking from under the cover a ſtring of pearls, which it encloſed, ran them over between his fingers, as they read their roſaries, and then with an arch air placed them by his ſide, nor would, while the narrator was in his preſence, permit any one to take them up. POORUNGEER ſays, the young LAMA regarded him with a very kind

and ſignificant look, ſpoke to him in the *Tibet* language, and aſked him if he had had a fatiguing journey. The interview laſted more than an hour, during all which time the LAMA ſat with the utmoſt compoſure, not once attempting to quit his ſeat, nor diſcovering the leaſt forward uneaſineſs at his confinement. Tea was twice brought in, and the LAMA drank a cup each time. When ordered to accept his diſmiſſion, POORUNGEER approached the LAMA, and bowing before him, preſented his head uncovered to receive his bleſſing, which the young LAMA gave by ſtretching out his hand and laying it on his head. He then ordered him for as long as he reſided at *Teeſhoo Loomboo* to come to him once every day.

The following morning POORUNGEER waited upon the regent at his apartments in the palace, to whom, after obſerving the cuſtomary forms of introduction, he delivered his diſpatches. After this he viſited SOOPOON-CHOOMBOO, the LAMA's parents, and others to whom he was before known, and ſays he experienced from all quarters the moſt cordial and kind reception; for they had been long uſed to conſider him as an agent of the Government of *Bengal*. He found no change whatever to have enſued in the adminiſtration ſince his attendance upon me in *Tibet*. The country enjoyed perfect tranquillity, and the only event that had taken place of importance in their annals was the inauguration of the infant LAMA, which happened the preceding year; and as this conſtitutes a concern of the higheſt moment, whether conſidered in a political or religious point of view, being no leſs than the recognizance in an infant form of their re-generated immortal ſovereign and eccleſiaſtical ſupreme, I was induced to beſtow more than common pains to trace the ceremonies that attended the celebration of ſuch a great event, conceiving that the novelty of the ſubject might render the account curious, if even it ſhould be found to contain no information of real utility. I ſhall therefore, without further apology, ſubjoin the reſult of my enquiries, premiſing only that my authority for the deſcription is derived principally from POORUNGEER, and confirmed, with ſome additional particulars, by the concurring reports of a *Goſſeyen*, who was at the time himſelf preſent on the ſpot.

The Emperor of *China* appears on this occaſion to have aſſumed a very conſpicuous part, in giving teſtimony of his reſpect and zeal for the great religious father of his faith. Early in the year 1784, he diſmiſſed ambaſſadors from the court of *Pekin* to *Teeſhoo Loomboo*, to repreſent their ſovereign in ſupporting the dignity of the high prieſt, and do honour to the occaſion of the aſſumption of his office. DALAI LAMA and the Viceroy of *Laſſa*, accompanied by all the court, one of the *Chineſe* Generals,

rals, ſtationed at *Laſſa* with a part of the troops under his command, two of the four magiſtrates of the city, the heads of every Monaſtery throughout *Tibet*, and the Emperor's ambaſſadors, appeared at *Teeſhoo Loomboo* to celebrate this epocha in their theological inſtitutions. The 28th day of the ſeventh moon, correſponding nearly, as their year commences with the vernal equinox, to the middle of October, 1784, was choſen as the moſt auſpicious for the ceremony of inauguration: a few days previous to which the LAMA was conducted from *Terpaling*, the Monaſtery in which he had paſſed his infancy, with every mark of pomp and homage that could be paid by an enthuſiaſtick people. So great a concourſe as aſſembled either from curioſity or devotion was never ſeen before, for not a perſon of any condition in *Tibet* was abſent who could join the ſuite. The proceſſion was hence neceſſarily conſtrained to move ſo ſlow, that though *Terpaling* is ſituated at the diſtance of twenty miles only from *Teeſhoo Loomboo*, three days expired in the performance of this ſhort march. The firſt halt was made at *Tſondue*; the ſecond at *Summaar*; about ſix miles off whence the moſt ſplendid parade was reſerved for the LAMA's entry on the third day; the account of which is given me by a perſon who was preſent in the proceſſion. The road, he ſays, was previouſly prepared by being whitened with a waſh, and having piles of ſtones heaped up, with ſmall intervals between, on either ſide. The retinue paſſed between a double row of prieſts, who formed a ſtreet extending all the way from *Summaar* to the gates of the palace. Some of the prieſts held lighted rods of a perfumed compoſition, that burn like decayed wood, and emit an aromatick ſmoke; the reſt were furniſhed with the different muſical inſtruments they uſe at their devotions, ſuch as the gong, the cymbal, hautboy, trumpets, drums, and ſea ſhells, which were all ſounded in union with the hymn they chanted. The croud of ſpectators were kept without the ſtreet, and none admitted on the high road but ſuch as properly belonged to or had a preſcribed place in the proceſſion, which was arranged in the following order.

The van was led by three military commandants or governors of diſtricts at the head of 6 or 7000 horſemen armed with quivers, bows, and matchlocks. In their rear followed the ambaſſador, with his ſuite, carrying his diploma, as is the cuſtom of *China*, made up in the form of a large tube, and faſtened on his back. Next the *Chineſe* General advanced with the troops under his command, mounted and accoutred after their way with fire arms and ſabres; then came a very numerous group bearing the various ſtandards and inſignia of ſtate; next to them moved a full band of wind and other ſonorous inſtruments; after which were led two horſes richly capariſoned, each

each carrying two large circular ſtoves diſpoſed like panniers acroſs the horſe's back and filled with burning aromatick woods. Theſe were followed by a ſenior prieſt, called a *Lama*, who bore a box containing books of their form of prayer and ſome favourite idols. Next nine ſumptuary horſes were led loaded with the LAMA's apparel; after which came the prieſts immediately attached to the LAMA's perſon for the performance of daily offices in the temple, amounting to about 700; following them were two men each carrying on his ſhoulder a large cylindrical gold inſignium emboſſed with emblematical figures (a gift from the Emperor of *China*). The *Duhunniers* and *Soopoons*, who were employed in communicating addreſſes and diſtributing alms, immediately preceded the LAMA's bier, which was covered with a gaudy canopy, and borne by eight of the ſixteen *Chineſe* appointed for this ſervice. On one ſide of the bier attended the Regent, on the other the LAMA's father. It was followed by the heads of the different Monaſteries, and as the proceſſion advanced, the prieſts who formed the ſtreet fell in the rear and brought up the ſuite, which moved at an extremely ſlow pace, and about noon was received within the confines of the Monaſtery amidſt an amazing diſplay of colours, the acclamations of the croud, ſolemn muſic, and the chanting of their prieſts.

The LAMA being ſafely lodged in the palace, the Regent and SOOPOON CHOOMBOO went out, as is a cuſtomary compliment paid to viſitors of high rank on their near approach, to meet and conduct DALAI LAMA and the Viceroy of *Laſſa* who were on the way to *Teeſhoo Loomboo*. Their retinues encountered the following morning at the foot of *Painom* caſtle, and the next day together entered the Monaſtery of *Teeſhoo Loomboo*, in which both DALAI LAMA and the Viceroy were accommodated during their ſtay.

The following morning, which was the third after TEESHOO LAMA's arrival, he was carried to the great temple, and about noon ſeated upon the throne of his progenitors; at which time the Emperor's ambaſſador delivered his diploma, and placed the preſents with which he had been charged at the LAMA's feet.

The three next enſuing days, DALAI LAMA met TEESHOO LAMA in the temple, where they were aſſiſted by all the prieſts in the invocation and publick worſhip of their Gods. The rights then performed completed, as I underſtand, the buſineſs of inauguration. During this interval all who were at the capital were entertained at the publick expence, and alms were diſtributed without reſerve. In conformity likewiſe to previous notice circulated every where for the ſame ſpace of time, univerſal rejoicings prevailed throughout *Tibet*. Banners were unfurled on all their fortreſſes,

the

the peaſantry filled up the day with muſick and feſtivity, and the night was celebrated by general illuminations. A long period was afterwards employed in making preſents and publick entertainments to the newly-inducted LAMA, who at the time of his acceſſion to the Muſnud, or, if I may uſe the term, pontificate, of *Teeſhoo Loomboo*, was not three years of age. The ceremony was begun by DALAI LAMA, whoſe offerings are ſaid to have amounted to a greater value, and his publick entertainments to have been more ſplendid, than the reſt. The ſecond day was dedicated to the Viceroy of *Laſſa*. The third to the *Chineſe* General. Then followed the Culloong or Magiſtrates of *Laſſa*, and the reſt of the principal perſons who had accompanied DALAI LAMA. After which the Regent of *Teeſhoo Loomboo*, and all that were dependent on that government, were ſeverally admitted, according to pre-eminence of rank, to pay their tributes of obeiſance and reſpect. As ſoon as the acknowledgements of all thoſe were received who were admiſſible to the privilege, TEESHOO LAMA made, in the ſame order, ſuitable returns to each, and the conſummation laſted forty days.

Many importunities were uſed with DALAI LAMA, to prolong his ſtay at *Teeſhoo Loomboo*, but he excuſed himſelf from encumbering the capital any longer with ſo numerous a concourſe of people as attended on his movements, and deeming it expedient to make his abſence as ſhort as poſſible from the ſeat of his authority, at the expiration of forty days he withdrew with all his ſuite to *Laſſa*, and the Emperor's ambaſſador received his diſmiſſion to return to *China*; and thus terminated this famous feſtival.

With reſpect to the lately-eſtabliſhed commercial intercourſe, POORUNGEER informs me that though ſo early, he found himſelf not the firſt perſon who had arrived at *Teeſhoo Loomboo* from *Bengal*. Many merchants had already brought their commodities to market, and others followed before he left it. He heard from no quarter any complaint of impediment or loſs, and concludes therefore that all adventurers met the ſame eaſy acceſs and ready aid as he himſelf had every where experienced. The markets were well ſtocked with *Engliſh* and *Indian* articles, yet not in ſo great a degree as to lower the value of commodities below the prices of the two or three laſt preceding years. Bullion was ſomewhat reduced in worth in compariſon with the year 1783. A pootree, or bulſe of gold duſt, the ſame quantity that then ſold for twenty-one Indermillees, was procurable of a purer quality for nineteen and twenty Indermillees. A talent of ſilver, which was then 500, was 450 Indermillees; ſo that the exchange was much in favour of the trader.

POORUN-

POORUNGEER, during his reſidence at *Teeſhoo Loomboo*, had very frequent interviews with the Regent and the miniſters, and aſſures me he found the heartieſt diſpoſitions in them to encourage the commercial intercourſe eſtabliſhed under the auſpices of the late Governor General, whoſe departure, however, the Regent regretted as the loſs of the firſt friend and ally he became connected with, of, I believe it may be ſaid, any foreign nation; in whom was acknowledged alſo the original means of opening the communication and of commencing a correſpondence between the Governments of *Bengal* and *Tibet*; and although it may be obſerved that, in conſequence of his having from the beginning been uſed excluſively to addreſs himſelf to, and acknowledge alone the agents of, Mr. HASTINGS, his attachments to the *Engliſh* nation had grown not without a great degree of perſonality, yet, free from an unworthy capriciouſneſs of temper, he deſcended not to take advantage of the opening offered by his friend's departure to cloſe the new connection. For ſuch was the reſpect he had learnt to entertain for our national integrity of character, that, under the apparent conviction our views tended to no ſcheme of ambition, but were confined merely to objects of utility and curioſity. POORUNGEER aſſures me he expreſſed an anxious deſire for continuing with the ſucceeding Governor General the exerciſe of thoſe offices of friendſhip ſo long ſupported by his predeceſſor; and in the hope that his would be met with equal wiſhes, determined to invite you to join him in preſerving the ſame intercourſe of commerce and correſpondence ſo eſſentially calculated for the benefit of both countries. In conſequence of which the LAMA and the Regent addreſſed the letters POORUNGEER had the honour to deliver to you, tranſlations of which having, in obedience to your directions, been applied for to your *Perſian* tranſlator, I now ſubjoin them.

Copy of a Letter from TEESHOO LAMA.

" God be praiſed, that the ſituation of theſe countries is in peace and happineſs, " and I am always praying at the altar of the Almighty for your health and preſerv- " ation. This is not unknown: you are certainly employed in protecting and aſſiſting " the whole world, and you promote the good and happineſs of mankind. We have " made no deviation from the union and unanimity, which exiſted during the time " of the firſt of nobles Mr. HASTINGS and the deceaſed LAMA, and may you alſo " grant friendſhip to theſe countries, and always make me happy with the news " of your health, which will be the cauſe of eaſe to my heart and confirmation to " my ſoul. At this time, as friendly offerings of union and unanimity, I ſend one

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" handkerchief, one ketoo of ſilver, and one piece of cochin. Let them be ac-
" cepted."

From the RAJAH *of* Teeſhoo Loomboo.

" God be praiſed, that the ſituation of theſe countries is in peace and happineſs,
" and I am always praying at the altar of the Almighty for your health and preſerv-
" ation. This is not unknown: I am conſtantly employed in promoting the ad-
" vantage of the ſubjects and the ſervice of the newly-ſeated LAMA, becauſe the
" newly-ſeated LAMA is not diſtinct from the deceaſed LAMA, and the light of his
" countenance is exalted. Grant your friendſhip to POORUNGEER *Goſſeyn*.

" Maintain union and unanimity and affection, like the firſt of nobles, and every
" day make me happy with the news of your health and proſperity, and beſtow
" favours like the firſt of nobles, and make me happy with letters, which are cauſes
" of conſolation. At this time, as friendly offerings of union and affection and una-
" nimity, I ſend one handkerchief, three tolah of gold, and one piece of cochin.
" Let them be accepted."

POORUNGEER, having received theſe diſpatches in the beginning of October, after a reſidence of five months at *Teeſhoo Loomboo*, took leave of the LAMA and the Regent, and ſet out on his return, by the ſame route he came, to *Bengal*. The weather at this ſeaſon of the year being moſt extremely favourable for travelling, he experienced no delay or interruption in the courſe of his journey through *Tibet* and *Bootan*, but arrived at *Rungpore* early in December, whence he proceeded as expeditiouſly as poſſible to the Preſidency; where, to his great mortification and concern, he finds upon his arrival his affairs involved in great diſtreſs: the little territory, his adopted Chela was left in charge of, having during his abſence been violently invaded by RAJA CHUND, a neighbouring Zemeendar, and to the amount of fifty begas forcibly taken out of his hands. Prevailed on by his earneſt repeated ſolicitations, I am induced to ſay for him, that in your juſtice and favour are his only hopes of relief from his embarraſſments, and he humbly ſupplicates your protection in reſtoring and ſecuring him in the poſſeſſion of his invaded right. The liberty of this interceſſion, I am confident to think, would be forgiven, were it not in favour of one who has rendered to this Government various uſeful ſervices; but as, though of trivial importance, it affords an authentick inſtance of the encroaching diſpoſition of inferior Zemeendars. Yet another circumſtance it may not be improper to point

out.

out. The ground alluded to is a part of the land ſituated upon the weſtern bank of the river oppoſite Calcutta, that was formerly granted under a Sunnud of this Government to TEESHOO LAMA, for the foundation of a temple of worſhip, and as a reſort for ſuch pilgrims of their nation, as might occaſionally make viſits to the conſecrated Ganges.

Having, in conformity to your deſires, done my beſt endeavours literally to tranſlate all the information POORUNGEER could give me, I have now only to apologize for the prolixity of the account, which I have been induced to be particularly minute in, as I conceived every circumſtance, however trivial, might be in ſome degree intereſting, that tends to illuſtrate any trait in the national character of a people we are but recently become acquainted with, and with whom in its extended views it has been an object of this Government to obtain a cloſer alliance.

I will not now preſume to intrude longer on your time by adding any obſervations on conjectures deducible from the elevated importance your young ally ſeems riſing to, in conſequence of the ſignal reſpect paid him by the moſt exalted political characters known to his nation; but beg leave to repeat that it is with infinite ſatisfaction, I learn from the reports of POORUNGEER the flouriſhing ſtate of the lately projected ſcheme of trade, to promote which, he aſſures me, not any thing had been wanting in facility of intercourſe: that the adventurers, who had inveſted their property, had experienced perfect ſecurity in conducting their commerce, carried their articles to an exceeding good market, and found the rate of exchange materially in their favour.

Thoſe advantages authorize the inference, that it will no doubt encourage more extenſive enterprize; and permit me to add, I derive a confidence from the ſucceſs of this infant eſſay, that inſpires me with the ſtrongeſt hopes, that the commiſſion which your Honourable Board was pleaſed to commit to my charge, will eventually be productive of eſſential benefits to the political and commercial intereſts of the Company.

I have the honour to be,
Honourable Sir,
With the greateſt reſpect,
Your moſt obedient, faithful,
And moſt humble Servant,
SAMUEL TURNER.

Calcutta, February 8, 1786.

IX.

ON THE GODS OF GREECE, ITALY, AND INDIA.—*See the Works of Sir William Jones, Vol. I. p. 229.*

X.

A DESCRIPTION OF A CAVE NEAR GYA'.

By JOHN HERBERT HARINGTON, *Eſq.*

A KNOWLEDGE of the antiquities of *Hindoſtan* forming one of the ſeveral objects propoſed by the inſtitution of our Society, with the hope of communicating ſomething acceptable on this head, I took the opportunity of a late excurſion up the country to ſee the *Cave* which Mr. HODGEKIS a few years ſince attempted to viſit, at the deſire, I believe, of the late Governor General, but was aſſaſſinated in his way to it by the followers of one of the rebellious Allies of CHYT SING. On my deſcribing it to the Preſident, whom I had the pleaſure to accompany, I was encouraged by him to think that a particular account of it would be curious and uſeful; and in conſequence made a ſecond viſit to it from *Gyá*, when I took the following meaſurements, and, by the means of my *Moonſhee*, a copy of the inſcription on it, which I had deſpaired of preſenting to you, but in its original language (a *Pundit* at *Benáris* having attempted in vain to get it read, during theſe laſt three months), till the kind aſſiſtance of Mr. WILKINS enabled me to add the accompanying tranſlation and remarks to what would otherwiſe have given little ſatisfaction.

The Hill, or rather Rock, from which the Cavern is dug, lies about fourteen miles North of the ancient city of *Gyá*, and ſeems to be one of the South Eaſtern Hills of the Chain of mountains called by RENNEL *Caramſhah*, both being a ſhort diſtance to the Weſt of the *Phulgó*.

It is now diſtinguiſhed by the name of *Nágurjenee*; but this may, perhaps, be a modern appellation; no mention of it being made in the inſcription. Its texture is a kind of Granite, called by the MOHUMMEDAN natives *Sung Kháreh*, which compoſes the whole Rock, of a moderate height, very craggy and uneven, and ſteep in its aſcent.

The *Cave* is ſituated on the Southern declivity, about two thirds from the ſummit: a tree immediately before it prevents its being ſeen from the bottom. It has only one narrow entrance, from the South, two feet and a half in breadth, ſix feet high, and of thickneſs exactly equal. This leads to a room of an oval form, with a vaulted roof, which I meaſured twice, and found to be forty-four feet in length from Eaſt to Weſt, eighteen feet and a half in breadth, and ten feet and a quarter in height at the centre. This immenſe cavity is dug entirely out of the ſolid rock, and is exceedingly well poliſhed, but without any ornament. The ſame ſtone extends much farther than the excavated part, on each ſide of it, and is altogether, I imagine, full a hundred feet in length. The inhabitants near know nothing of its hiſtory or age, but I learnt from the chief of a neighbouring village, that a tradition is extant of a MOHUMMEDAN, named MINHA'J-U-DEEN, having performed his *Cheeleh*, or forty days devotion, in this Cavern; and that he was cotemporary with MUKHDOOM SHERF-U-DEEN, a venerated *Welee*, who died in *Behár* in the 590th year of the *Hijree*; and he even went ſo far as to aver that he himſelf was deſcended from MINHA'J-U-DEEN, and had records at *Patna* of his family's genealogy to the preſent time. What credit is due to this I will not pretend to ſay, but the room is certainly now frequented by MOHUMMEDANS, and has been for ſome time, as there are the remains of an old moſque cloſe before it, and within, a raiſed terrace, ſuch as the MOHUMMEDAN devotees are uſed to conſtruct for their religious retirement. There are two inſcriptions, one on each ſide of the interior part of the entrance; impreſſions of both which my *Moonſhee* took off in the courſe of three days, with much trouble, and ſufficient accuracy to enable Mr. WILKINS to underſtand and explain the whole of one, though many *Pundits*, I was informed, who had ſeen the original engraving, had attempted in vain to decypher it. The other, which conſiſts of one line only, is unfortunately of a different character, and remains ſtill unintelligible.

The following letter and remarks, which Mr. WILKINS has favoured me with, make it unneceſſary for me to ſay any thing of the contents of the inſcription: I can only regret with him that the date is yet undiſcovered; as what is now but a gratification of curioſity might then have been a valuable clue to the illuſtration of obſcure events in ancient hiſtory. There are, however, ſeveral other *Caves* in the adjoining hills, which I likewiſe viſited, but had not time to take the inſcriptions: and from theſe, I hope, a date will be diſcovered.

Were any other teſtimony beſides the inſcription wanted, to ſhew that theſe

Caves

उ लि द्र स्य स रो रु ह स्य स कला मा क्षिप्य शो भं रु चा सा व र्त्तं म हि षा सु र स्य शि र सि न्य स्तः क्र ण नू पु रः

दे व्या वः स्थि र भ क्ति वा द स दृ शां पु ञ्ज न्ने ना ङ्घ्रि त दि श्या द च्छ न खां कु जा ल ज टि लः पा दः १ दं सं १ दं

आ सी टि ष्ट स र द्व य त्न म टि मा श्री या ज्ञ व र्मा न्द पः म ख्या तो वि म ले न्दु नि र्म्म ल प शा क्षा त्र स्य धा म्नः १ दं

प्र ज्ञा ना ञ्च य दा न वि क्र म गु णै र्यो रा ज क स्या ग्र णी भू त्वा पि म कृ नि स्थ यं भ वि न या द क्षा म्य स तो ट धि

त स्या दी र्ण म हा र्ण वो प म र ण व्या पा र ल ब्धं य शः त न्वा नः क कु दं म ख्व कु क कु भा की र्त्या जि ते द पु गः

श्री मा न न्व सु हृ ज्ज न प्र ण यि न मा शाः फ लैः पू र पु त्रः क ल्प त रो रि वा प म हि मा शा र्द्द ल व र्म्मा नृ पः

त स्या न ल म न ल की र्त्ति प श सो न ला दि व म्मा ख्या ख्या तं नो हि त भ क्ति भा वि धि यां पु त्रे ण पू तो त्मन

आ सू र्य क्षि ति च न्द्र ता र क मि यं पु ण्या स्प दं व र्द्धि त वि न्यस्ता द्भु त वि न्ध्य भू ध र गु हा मा श्रि त्य का त्या य नी

धी ता घो म ल प ङ्क दो ण म म लै र्मो हा न्ध कै र त्त मिः श्या धू तो प व न प्रि य हु त कु लै रा मो दि तं वा यु भिः

क ल्पा न्ता व धि न ग्य मु च्च शि ख रै श्छा या स्त ता ङ्कु द्यु ति ग्रा म म न न्य भा ग वि भ वं र न्यं म वा न्य द दा

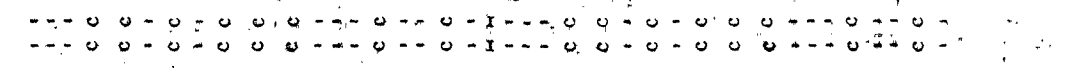
Caves were religious temples, the remains of three defaced Images near another which I viſited, called *Curram Choſſar*, would be ſufficient proof of it. A third, the name of which I could not learn, has its entrance very curiouſly wrought with Elephants and other ornaments, of which, I hope, in a ſhort time, to preſent a Drawing to the Society.

A LETTER FROM CHARLES WILKINS, ESQ. TO THE SECRETARY.

DEAR SIR,

HAVING been ſo fortunate as to make out the whole of the very curious inſcription you were ſo obliging as to lend me, I herewith return it, accompanied by an exact copy, in a reduced ſize, interlined with each correſponding letter in the modern *Dēwnāgăr* character; and alſo a copy of my tranſlation, which is as literal as the idioms would admit it to be.

The character is undoubtedly the moſt ancient of any that have hitherto come under my inſpection. It is not only diſſimilar to that which is now in uſe, but even very materially different from that we find in inſcriptions of eighteen hundred years ago. But though the writing be not modern, the language is pure *Samſkreet*, written in a long verſe, called *Sārdōōlă-vĕĕkrēērĕĕtă*, and conſiſts of four pauſes of nineteen ſyllables each, in this form:



The metre was no ſmall help in decyphering the vowels.

The firſt lines of the firſt verſe allude to the ſtory of *Bhăwānēē*'s killing the evil ſpirit *Măhĕĕſhāsŏŏr*, who, in the diſguiſe of a Buffalo, as the name imports, had fought with *Eendră*, and his celeſtial bands for a hundred years, defeated him, and uſurped his throne. The ſtory is to be found at large in a little book called *Chandee*. The vanquiſhed ſpirits, being baniſhed the heavens and doomed to wander the earth, after a while aſſemble, with their chief *Eendra* at their head, and reſolve to lay their grievances before *Vĕĕſhnŏŏ* and *Sĕĕv*. Conducted by *Brăhmā*, they repair into

into the preſence of thoſe Deities, who heard their complaints with compaſſion; and their anger was ſo violent againſt *Măhĕĕſhāsŏŏr*, that a kind of flame iſſued from their mouths, and from the mouths of the reſt of the principal Gods, of which was formed a Goddeſs of inexpreſſible beauty with ten arms, and each hand holding a different weapon. This was a transfiguration of *Bhă-wānēē* the conſort of *Sĕĕv*, under which ſhe is generally called *Dŏŏrgā*. She is ſent againſt the uſurper. She mounts her lion, the gift of the mountain *Hĕĕmālăy* (ſnowy), and attacks the Monſter, who ſhifts his form repeatedly; till at length the Goddeſs *planteth her foot upon his head*, and cuts it off with a ſingle ſtroke of her ſword. Immediately the upper part of a human body iſſues through the neck of the headleſs Buffalo and aims a ſtroke, which being warded off by the lion with his right paw, *Dŏŏrgā* puts an end to the combat by piercing him through the heart with a ſpear. I have in my poſſeſſion a ſtatue of the Goddeſs with one foot on her lion, and the other on the monſter, in the attitude here laſtly deſcribed.

The want of a date diſappointed my expectations. I had ſome hopes that it was contained in the ſingle line, which you informed me was taken from another part of the *Cave*; but although I have not yet ſucceeded in making out the whole, I have diſcovered enough to convince me that it contains nothing but an invocation. If you ſhould be ſo fortunate as to obtain correct copies of the reſt of the inſcriptions, that are to be found in the *Caves* of thoſe mountains, I make no doubt, but that we ſhall meet with ſome circumſtance or other, that will guide us to a diſcovery of their antiquity.

I have the pleaſure to ſubſcribe myſelf,

Dear Sir,

Your very ſincere friend,

And obedient humble Servant,

CHARLES WILKINS.

Calcutta, 17th March, 1785.

A TRANSLA-

A TRANSLATION OF A SANSCRIT INSCRIPTION.

WHEN the foot of the Goddeſs (1) was, with its tinkling ornaments, planted upon the head of *Măhĕ ſhāsŏŏr* (2), all the bloom of the new-blown flower of the fountain (3) was diſperſed, with diſgrace, by its ſuperior beauty. May that foot, radiant with a fringe of refulgent beams iſſuing from its pure bright nails, endue you with a ſteady and an unexampled devotion, offered up with fruits, and ſhew you the way to dignity and wealth!

The illuſtrious *Yăgnă Vărmā*, was a Prince whoſe greatneſs conſiſted in free-will offerings. His reputation was as unſullied as the Moon. He was renowned amongſt the Martial Tribes; and, although he was, by deſcent, by wiſdom, courage, charity and other qualities, the fore-leader of the royal line; yet, from the natural humility of his temper, he diſturbed not the powerful ocean.

His auſpicious ſon, *Sărdōōlă Vărmā*, a Prince whoſe magnificence flowed, as it were, from the tree of imagination (4), diſplayed the enſign of royalty in ſacrifices, and the world was ſubdued by his infinite renown. He gratified the hopes of relations, friends and dependants; and honour was achieved from the deed of death (5) near the upriſing ocean.

By his pious ſon, called *Ănănță Vărmă* becauſe of his infinite renown, the holy abode of us contemplative men, who are always ſtudious for his good and employed in his ſervice, hath been increaſed and rendered famous as long as the earth, the ſun and moon, and ſtarry heaven, ſhall endure; and *Kătyāyănēē* (6) having taken ſanctuary, and being placed, in this cavern of the wonderful *Veen'ayă* (7) mountains.

The holy Prince gave unto *Bhăwānēē*, in perpetuity, the village ——— (8) and its hilly lands, by whoſe lofty mountain-tops the ſunny beams are caſt in ſhade: its filth and impurities are waſhed away by the precious ſtores of the

(1) *Bhăwānēē* the wife of *Seev*.
(2) The name of an evil ſpirit.
(3) Epithet of the lotus.
(4) In the original *Kălpă-tărŏŏ*, a fabulous tree which yielded every thing that was demanded.
(5) He was probably carried to *Gănga-Săgăr* to die.
(6) One of the names of *Dŏŏrgă* or *Bŏwānēē*.
(7) The name of the chain of mountains which commences at *Chunar*.
(8) The name, which conſiſted of two long ſyllables, is wanting in the original.

Măhānădā

Măhānădā (1), and it is refreſhed by the breezes from the waving *Prĕĕyăngŏŏs* (2) and *Băkŏŏlăs* (3) of its groves.

XI.

TRANSLATION OF A SANSCRIT INSCRIPTION, COPIED FROM A STONE AT BŎŎD-DHĂ-GĂYĂ, BY MR. WILMOT, 1785.

Tranſlated by CHARLES WILKINS, *Eſq.*

IN the midſt of a wild and dreadful foreſt, flouriſhing with trees of ſweet-ſcented flowers, and abounding in fruits and roots; infeſted with Lions and Tigers; deſtitute of human Society, and frequented by the *Moonees*, reſided *Bŏŏd-dhă*, the Author of Happineſs, and a portion of *Narayan*. This Deity *Hărĕĕ*, who is the Lord *Hărēēſa*, the poſſeſſor of all, appeared in this ocean of natural Beings at the cloſe of the *Devāpără*, and beginning of the *Kălĕĕ Yoog*: he who is omnipreſent and everlaſtingly to be contemplated, the Supreme Being, the Eternal One, the Divinity worthy to be adored by the moſt praiſe-worthy of mankind, appeared here with a portion of his divine nature.

Once upon a time the illuſtrious *Ămără*, renowned amongſt men, coming here, diſcovered the place of the Supreme Being, *Bŏŏd-dhă*, in the great foreſt. The wiſe *Ămără* endeavoured to render the God *Bŏŏd-dhă* propitious by ſuperior ſervice; and he remained in the foreſt for the ſpace of twelve years, feeding upon roots and fruits, and ſleeping upon the bare earth; and he performed the vow of a *Moonee*, and was without tranſgreſſion. He performed acts of ſevere mortification, for he was a man of infinite reſolution, with a compaſſionate heart. One night he had a viſion and heard a voice ſaying: "Name whatever boon thou wanteſt." *Ămără Deva*, having

(1) Probably the river called the *Mahonah* in RENNEL's Map of South *Bahar*.
(2) Probably the *Champa*.
(3) *Mouſferee*.

heard

heard this, was aſtoniſhed, and with due reverence replied, "Firſt, give me a viſi-
"tation, and then grant me ſuch a boon." He had another dream in the night, and the voice ſaid: "How can there be an apparition in the *Kălĕĕ Yoog?* the "ſame reward may be obtained from the ſight of an image, or from the worſhip of "an image, as may be derived from the immediate viſitation of a deity." Having heard this he cauſed an image of the Supreme Spirit *Bŏŏd-dhă* to be made, and he worſhipped it, according to the law, with perfumes, incenſes, and the like; and he thus glorified the name of that Supreme Being, the incarnation of a portion of *Veeſhnoo*; "Reverence be unto thee in the form of *Bŏŏd-dhă!* Reverence be unto "the Lord of the Earth! Reverence be unto thee, an incarnation of the Deity and "the Eternal One! Reverence be unto thee, O God, in the form of the God "of Mercy;—the diſpeller of pain and trouble, the Lord of all things, the Deity "who overcometh the ſins of the *Kălĕĕ Yoog*, the Guardian of the Univerſe, the "Emblem of Mercy towards thoſe who ſerve thee—*ōm!* the poſſeſſor of all things "in vital form! Thou art *Brăhmă*, *Veeſhnoo*, and *Măhéſa!* Thou art Lord of the "Univerſe! Thou art, under the proper form of all things moveable and immove-"able, the poſſeſſor of the whole! and thus I adore thee. Reverence be unto the "beſtower of ſalvation, and *Reſheekéſă*, the ruler of the faculties! Reverence be "unto thee *(Kéſavă)*, the deſtroyer of the evil ſpirit *Kéſee!* O *Dāmŏrdără*, ſhew "me favour! Thou art he who reſteth upon the face of the milky ocean, and who "lyeth upon the ſerpent *Séſă*, Thou art *Trĕĕviĕkrămă* (who at three ſtrides encom-"paſſed the Earth!) I adore thee, who art celebrated by a thouſand names, and "under various forms in the ſhape of *Bŏŏd-dhă* the God of Mercy! Be propitious, "O moſt high God!"

Having thus worſhipped the guardian of mankind, he became like one of the juſt. He joyfully cauſed a holy temple to be built of a wonderful conſtruction, and therein were ſet up the divine foot of *Veeſhnoo* for ever purifier of the ſins of mankind, the images of the *Pāndŏŏs* and of the deſcents of *Veeſhnoo*, and in like manner of *Brāhmă*, and the reſt of the divinities.

This place is renowned; and it is celebrated by the name of *Bŏŏd-dhă-Găyă*. The forefathers of him who ſhall perform the ceremony of the *Sradha* at this place ſhall obtain ſalvation. The great virtue of the *Sradha* performed here, is to be found in the book called *Vāyŏŏ-pŏŏrānā*; an epitome of which hath by me been engraved upon ſtone.

Vĕĕkrămādéĕtyă was certainly a king renowned in the world. So in his court there

there were nine learned men, celebrated under the epithet of the *Năvă-ratnānĕĕ* or nine jewels; one of whom was *Ămără Dĕvā*, who was the King's Chief Counſellor, a man of great genius and profound learning, and the greateſt favourite of his prince. He, it certainly was, who built the holy temple which deſtroyeth ſin, in a place in *Jamboodweep*, where, the mind being ſteady, it obtains its wiſhes, and in a place where it may obtain ſalvation, reputation, and enjoyment, even in the country of *Bhărătă*, and the province of *Kēēkătă*, where the place of *Bŏŏd-dhă*, purifyer of the ſinful, is renowned. A crime of an hundred fold ſhall undoubtedly be expiated from a ſight thereof, of a thouſand fold from a touch thereof, and of a hundred thouſand fold from worſhipping thereof. But where is the uſe of ſaying ſo much of the great virtues of this place? even the hoſts of heaven worſhip with joyful ſervice both day and night.

That it may be known to learned men, that he verily erected the houſe of *Bŏŏd-dhă*, I have recorded, upon a ſtone, the authority of the place, as a ſelf-evident teſtimony, on Friday, the fourth day of the new moon in the month of *Madhoo*, when in the ſeventh or manſion of *Gănișă*, and in the year of the *Era* of *Vĕĕkrămādĕĕtyă* 1005.

XII.

TO

SECRETARY *to the* ASIATICK SOCIETY.

SIR,

BEFORE I left *Calcutta*, a gentleman, with whom I chanced to be diſcourſing of that ſect of people who are diſtinguiſhed from the worſhippers of *Brăhm* and the followers of MAHOMMED by the appellation *Seek*, informed me that there was a conſiderable number of them ſettled in the city of *Patna*, where they had a college for teaching the tenets of their philoſophy. As *Patna* was in my way to *Banaris*, I no ſooner arrived there than I inquired after the college, and I was preſently conducted to it; and I now requeſt you will pleaſe to lay before the Society, the few obſervations and inquiries which a ſingle viſit of about two hours would admit of my making. If, ſuch as they are, they ſhould hereafter be found uſeful either as a clue

clue to guide another in his reſearches in the ſame path, or to add to ſome future account to render it more complete, my end in troubling you to lay it before the Society is fully anſwered.

I have the honour to ſubſcribe myſelf,
Sir,
Your moſt obedient humble Servant,
CHARLES WILKINS.

Banaris, 1ſt March, 1781.

I FOUND the college of the *Seeks*, ſituated in one of the narrow ſtreets of *Patna*, at no very conſiderable diſtance from the Cuſtom-houſe. I was permitted to enter the outward gate, but, as ſoon as I came to the ſteps which led up into the chapel, or publick hall, I was civilly accoſted by two of the ſociety. I aſked them if I might aſcend into the hall: They ſaid it was a place of worſhip open to me and to all men; but, at the ſame time, intimated that I muſt take off my ſhoes. As I conſider this ceremony in the ſame light as uncovering my head upon entering any of our temples dedicated to the Deity, I did not heſitate to comply, and I was then politely conducted into the hall, and ſeated upon a carpet, in the midſt of the aſſembly, which was ſo numerous as almoſt to fill the room. The whole building forms a ſquare of about forty feet, raiſed from the ground about ſix or eight ſteps. The hall is in the center, divided from four other apartments by wooden arches, upon pillars of the ſame materials, all neatly carved. This room is rather longer than it is broad. The floor was covered with a neat carpet, and furniſhed with ſix or ſeven low deſks, on which ſtood as many of the books of their law; and the walls, above the arches, were hung with European looking glaſſes in gold frames, and pictures of *Muſſulman* princes, and *Hindoo* deities. A little room, which, as you enter, is ſituated at the left hand end of the hall, is the chancel, and is furniſhed with an altar covered with a cloth of gold, upon which was laid a round black ſhield over a long broad-ſword, and, on either ſide, a *chowry* of peacocks' feathers, mounted in a ſilver handle. The altar was raiſed a little above the ground, in a declining poſition. Before it ſtood a low kind of throne plated with ſilver; but rather too ſmall to be uſeful; about it were ſeveral ſilver flower pots and roſe water bottles, and on the left hand ſtood three ſmall *urns* which appeared to be copper, furniſhed with notches to receive the donations of the charitable. There ſtood alſo near the altar, on a low deſk, a great book of a folio ſize, from which ſome por-

tions are daily read in their divine ſervice. It was covered over with a blue mantle, on which were printed, in ſilver letters, ſome ſelect paſſages of their law.

After I had had a long converſation with two of the congregation, who had politely ſeated themſelves, on each ſide of me, on the carpet, and whom I found very intelligent, notice was given, that it was noon and the hour of divine ſervice. The congregation arranged themſelves upon the carpet, on each ſide of the hall, ſo as to leave a ſpace before the altar from end to end. The great book, deſk, and all, was brought, with ſome little ceremony, from the altar, and placed at the oppoſite extremity of the hall. An old man, with a reverend ſilver beard, kneeled down before the deſk with his face towards the altar; and on one ſide of him ſat a man with a ſmall drum, and two or three with cymbals. The book was now opened, and the old man began to chant to the time of the drum and the cymbals; and, at the concluſion of every verſe, moſt of the congregation joined chorus in a reſponſe, with countenances exhibiting great marks of joy. Their tones were by no means harſh; the time was quick; and I learnt that the ſubject was a hymn in praiſe of the Unity, the Omnipreſence, and the Omnipotence, of the Deity. I was ſingularly delighted with the geſtures of the old man: I never ſaw a countenance ſo expreſſive of infelt joy, whilſt he turned about from one to another, as it were, beſpeaking their aſſents to thoſe truths which his very ſoul ſeemed to be engaged in chanting forth. The hymn being concluded, which conſiſted of about twenty verſes, the whole congregation got up and preſented their faces with joined hands towards the altar, in the attitude of prayer. A young man now ſtood forth; and, with a loud voice and diſtinct accent, ſolemnly pronounced a long prayer or kind of liturgy, at certain periods of which all the people joined in a general reſponſe, ſaying *Wā Gooroo!* They prayed againſt temptation; for grace to do good; for the general good of mankind; and a particular bleſſing to the *Seeks:* and for the ſafety of thoſe who at that time were on their travels. This prayer was followed by a ſhort bleſſing from the old man, and an invitation to the aſſembly to partake of a friendly feaſt. The book was then cloſed and reſtored to its place at the altar, and the people being ſeated as before, two men entered bearing a large iron caldron, called a *curray*, juſt taken from the fire, and placed it in the center of the hall upon a low ſtool. Theſe were followed by others with five or ſix diſhes, ſome of which were of ſilver, and a large pile of leaves ſewed together with fibres in the form of plates. One of theſe plates was given to each of the company without diſtinction, and the diſhes being filled from the caldron, their contents were ſerved out till every

one

one had got his ſhare: myſelf was not forgotten; and, as I was reſolved not to give them the ſmalleſt occaſion for offence, I ate up my portion. It was a kind of ſweetmeat, of the conſiſtence of ſoft brown ſugar, compoſed of flour and ſugar mixed up with clarified butter, which is called *Ghee*. Had not the *Ghee* been rancid I ſhould have reliſhed it better. We were next ſerved with a few ſugar plums; and here ended the feaſt and the ceremonies of the day. They told me the religious part of the ceremony was daily repeated five times. I now took my leave, inviting ſome of the principal men amongſt them, who were about to return to their own country through *Banaris*, to pay me a viſit.

In the courſe of the converſation I was engaged in with the two *Seeks* before the ſervice, I was able to gather the following circumſtances. That the founder of their faith was called *Nāneek Sah*, who flouriſhed about four hundred years ago at *Punjab*, and who, before his apoſtaſy, was a *Hindōo* of the *Kſhétry*, or military tribe; and that his body diſappeared as the *Hindoos* and the *Muſſulmans* were diſputing for it; for upon their removing the cloth which covered it, it was gone. That he left behind him a book, compoſed by himſelf, in verſe and the language of *Punjab*, but a character partly of his own invention; which teaches the doctrines of the faith he had eſtabliſhed. That they call this character, in honour of their founder, *Gooroo-Mookhee: from the mouth of the preceptor*; that this book, of which that ſtanding near the altar, and ſeveral others in the hall, were copies, teaches that there is but one God, omnipotent and omnipreſent; filling all ſpace, and pervading all matter; and that he is to be worſhipped and invoked. That there will be a day of retribution, when virtue will be rewarded and vice puniſhed (I forgot to aſk in what manner); that it not only commands univerſal toleration, but forbids diſputes with thoſe of another perſuaſion. That it forbids murder, theft, and ſuch other deeds as are, by the majority of mankind, eſteemed crimes againſt ſociety; and inculcates the practice of all the virtues, but particularly an univerſal philanthropy, and a general hoſpitality to ſtrangers and travellers. This is all my ſhort viſit would permit me to learn of this book. It is a folio volume, containing about four or five hundred pages.

They told me further, that ſome years after this book of *Nāneek Sah* had been promulgated, another made its appearance, now held in almoſt as much eſteem as the former. The name of the author has eſcaped my memory; but they favoured me with an extract from the book itſelf in praiſe of the Deity. The paſſage had ſtruck my ear on my firſt entering the hall, when the ſtudents

were

were all engaged in reading. From the ſimilarity of the language to the *Hindoovee*, and many *Shanſcrit* words, I was able to underſtand a good deal of it, and I hope, at ſome future period, to have the honour of laying a tranſlation of it before the Society. They told me I might have copies of both their books, if I would be at the expence of tranſcribing them.

I next inquired why they were called *Seeks*, and they told me it was a word borrowed from one of the commandments of their founder, which ſignifies "*Learn* "*thou*;" and that it was adopted to diſtinguiſh the ſect ſoon after he diſappeared. The word, as is well known, has the ſame import in the *Hindoovee*.

I aſked them what were the ceremonies uſed in admitting a proſelyte. A perſon having ſhewn a ſincere inclination to renounce his former opinions, to any five or more *Seeks* aſſembled together, in any place, as well on the highway as in a houſe of worſhip, they ſend to the firſt ſhop where ſweetmeats are ſold, and procure a ſmall quantity of a particular ſort, which is very common, and as I recollect, they call *Batāſā*, and having diluted it in pure water, they ſprinkle ſome of it on the body, and into the eyes of the convert, whilſt one of the beſt inſtructed repeats to him, in any language with which he is converſant, the chief canons of their faith, exacting from him a ſolemn promiſe to abide by them the reſt of his life. This is the whole of the ceremony. The new convert may then chooſe a *Gooroo*, or preceptor, to teach him the language of their ſcriptures, who firſt gives him the alphabet to learn, and ſo leads him on, by ſlow degrees, until he wants no further inſtruction. They offered to admit me into their ſociety; but I declined the honour; contenting myſelf with the alphabet which they told me to guard as the apple of my eye, as it was a ſacred character. I find it differs but little from the *Dewnagur*: the number, order, and powers, of the letters are exactly the ſame. The language itſelf is a mixture of *Perſian*, *Arabick*, and ſome *Shanſcrit*, grafted upon the provincial dialect of *Punjab*, which is a kind of *Hindoovee*, or, as it is vulgarly called by us, *Moors*.

XIII.

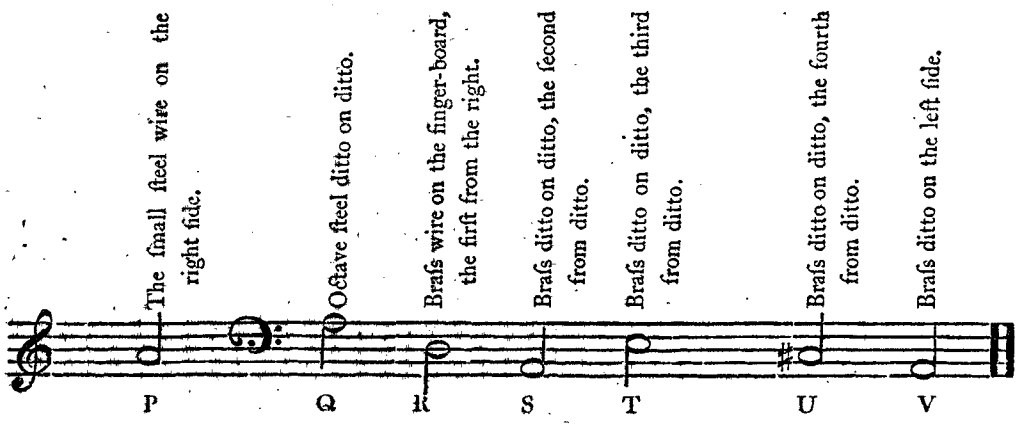
AN EXTRACT OF A LETTER FROM FRANCIS FOWKE, ESQ. TO THE PRESIDENT.

THE drawings of JEEWUN SHAH and the *Been*, will be diſpatched in a ſmall boat to-morrow. You wiſhed to have had the two attendant muſicians in the ſame drawing with JEEWUN SHAH; but the draftſman was not equal to the perſpective of this: he would have run all the figures one into the other: and as he has ſucceeded tolerably well with the principal figures, I thought it was better to be ſure of that, eſpecially as the other figures can eaſily be added by an *European* artiſt. I have a double pleaſure in ſending you the encloſed account of the *Been*. In obliging you I look forward to the inſtructive amuſement I ſhall ſhare with the publick at large in the reſult of your reſearches into this ſubject of *Indian* muſick; and I am exceedingly happy by furniſhing you with facts, highly neceſſary indeed, but the mere work of care and obſervation, to give you greater leiſure for the contemplation of the whole. You may abſolutely depend upon the accuracy of all that I have ſaid reſpecting the conſtruction and ſcale of this inſtrument. It has all been done by meaſurement: and with regard to the intervals I would not depend upon my ear, but had the *Been* tuned to the harpſichord, and compared the inſtruments carefully note by note more than once. What I myſelf am aware of, will certainly not eſcape your penetration, that there may be a little of the bias of hypotheſis, or an opinion pretty ſtrongly eſtabliſhed in what I have ſaid of the confined modulation of the *Indian* muſick. But it is eaſy to ſeparate my experiments and conjectures, and my prejudices cannot miſlead you, though they may poſſibly ſuggeſt an uſeful hint, as half errors often do.

THE *Been* is a fretted inſtrument of the guitar kind. The finger-board is 21$\frac{6}{8}$ths inches long. A little beyond each end of the finger-board are two large gourds, and beyond theſe are the pegs and tail-piece which hold the wires. The whole length of the inſtrument is three feet ſeven inches. The firſt gourd is fixed at ten inches from the top, and the ſecond at about two feet 11$\frac{1}{2}$. The gourds are very large, about fourteen inches diameter, and have a round piece cut out of the bottom about five inches in diameter. The finger-board is about two inches wide. The

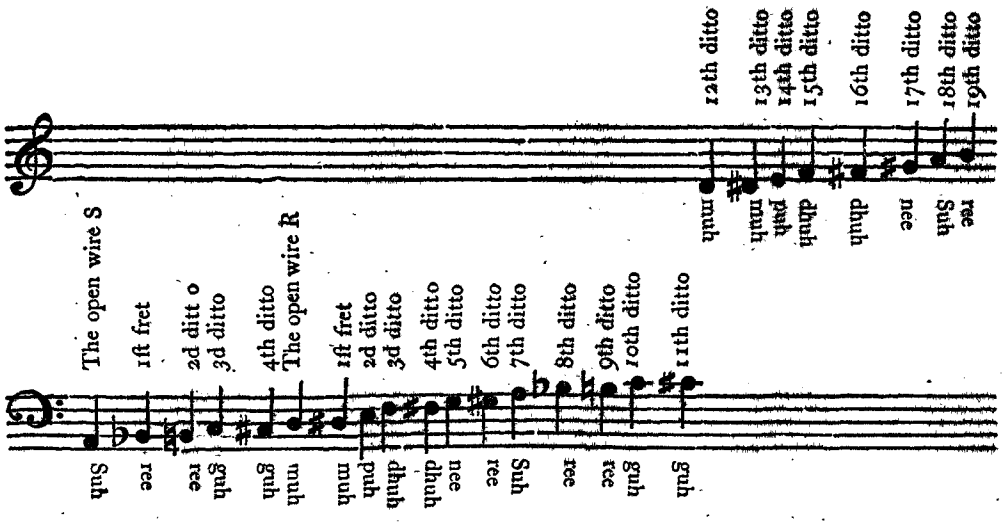
wires

wires are ſeven in number, and conſiſt of two ſteel ones very cloſe together in the right ſide, four braſs ones on the finger-board, and one braſs one on the left ſide. They are tuned in the following manner.



The great ſingularity of this inſtrument is the height of the frets; that neareſt the nut is one inch $\frac{5}{12}$, and that at the other extremity about $\frac{7}{12}$ths of an inch, and the decreaſe is pretty gradual. By this means the finger never touches the finger-board itſelf The frets are fixed on with wax by the performer himſelf, which he does entirely by ear. This was aſſerted by PEAR CAWN, the brother of JEEWUN SHAH, who was ill at the time, but PEAR CAWN is a performer very little, if at all, inferiour to JEEWUN SHAH. The frets of PEAR CAWN's inſtrument were tolerably exact; any little difference is eaſily corrected by the preſſure of the finger: indeed, the performers are fond, on any note that is at all long, of preſſing the ſtring very hard, and letting it return immediately to its natural tenſion, which produces a ſound ſomething like the cloſe ſhake on the violin, but not with ſo agreeable an effect, for it appears ſometimes to alter the ſound half a tone.

The frets are nineteen in number. The notes that they give will appear on the following ſcale. I have added below the names which the performer himſelf gives to the notes in his own language. It is very obſervable, that the ſemitones change their names on the ſame ſemitone as in the *European* ſcale.



On the wires R and S, which are thoſe principally uſed, there is an extent of two octaves, a whole note with all the half notes, complete in the firſt octave, but the g ♮ and b ♭ wanting in the ſecond. The performer's apology for this was that he could eaſily get thoſe notes by preſſing the ſtring a little hard upon the frets f ♯ and a ♮, which is very true from the height of the frets, but he aſſerted that this was no defect in his particular inſtrument but that all *Beens* were made ſo. The wires TU are ſeldom uſed except open.

The *Been* is held over the left ſhoulder, the upper gourd reſting on that ſhoulder, and the lower one on the right knee.

The frets are ſtopped with the left hand, the firſt and ſecond fingers are principally uſed. The little finger of the hand is ſometimes uſed to ſtrike the note V. The third finger is ſeldom uſed, the hand ſhifting up and down the finger board with great rapidity. The fingers of the right hand are uſed to ſtrike the ſtrings of this hand, the third finger is never uſed. The two firſt fingers ſtrike the wires on the finger-board, and the little finger ſtrikes the two wires. The two firſt fingers of this hand are defended by a piece of wire put on the tops of them in the manner of a thimble, when the performer plays ſtrong this cauſes a very jarring diſagreeable ſound, whereas when he plays ſoftly the tone of the inſtrument is remarkably pleaſing.

The ſtyle of muſick on this inſtrument is in general that of great execution. I could hardly ever diſcover any regular air or ſubject. The muſick ſeems to conſiſt of a number

number of detached paſſages, ſome very regular in their aſcent and deſcent, and thoſe that are played ſoftly are moſt of them both uncommon and pleaſing.

The open wires are ſtruck from time to time in a manner that, I think, prepares the ear for a change of modulation to which the uncommonly full and fine tones of theſe notes greatly contribute; but the ear is I think always diſappointed: and, if there is ever any tranſition from the principal key, I am inclined to think it is very ſhort. Were there any other circumſtances reſpecting the *Indian* muſick, which led to ſuppoſe that it has at ſome period been much ſuperiour to the preſent practice, the ſtyle, ſcale, and antiquity of this inſtrument, would I think greatly confirm the ſuppoſition.

XIV.

A DESCRIPTION OF THE MA'HWAH TREE.

By Lieutenant CHARLES HAMILTON.

THERE is a very curious and uſeful tree called by the Natives of *Bahar*, and the neighbouring countries, the *Máhwah* or *Máwee*; its name, as written by them, being ०त्; but the *Sanſcrit* name is *Madhúca* or *Madhudruma*.

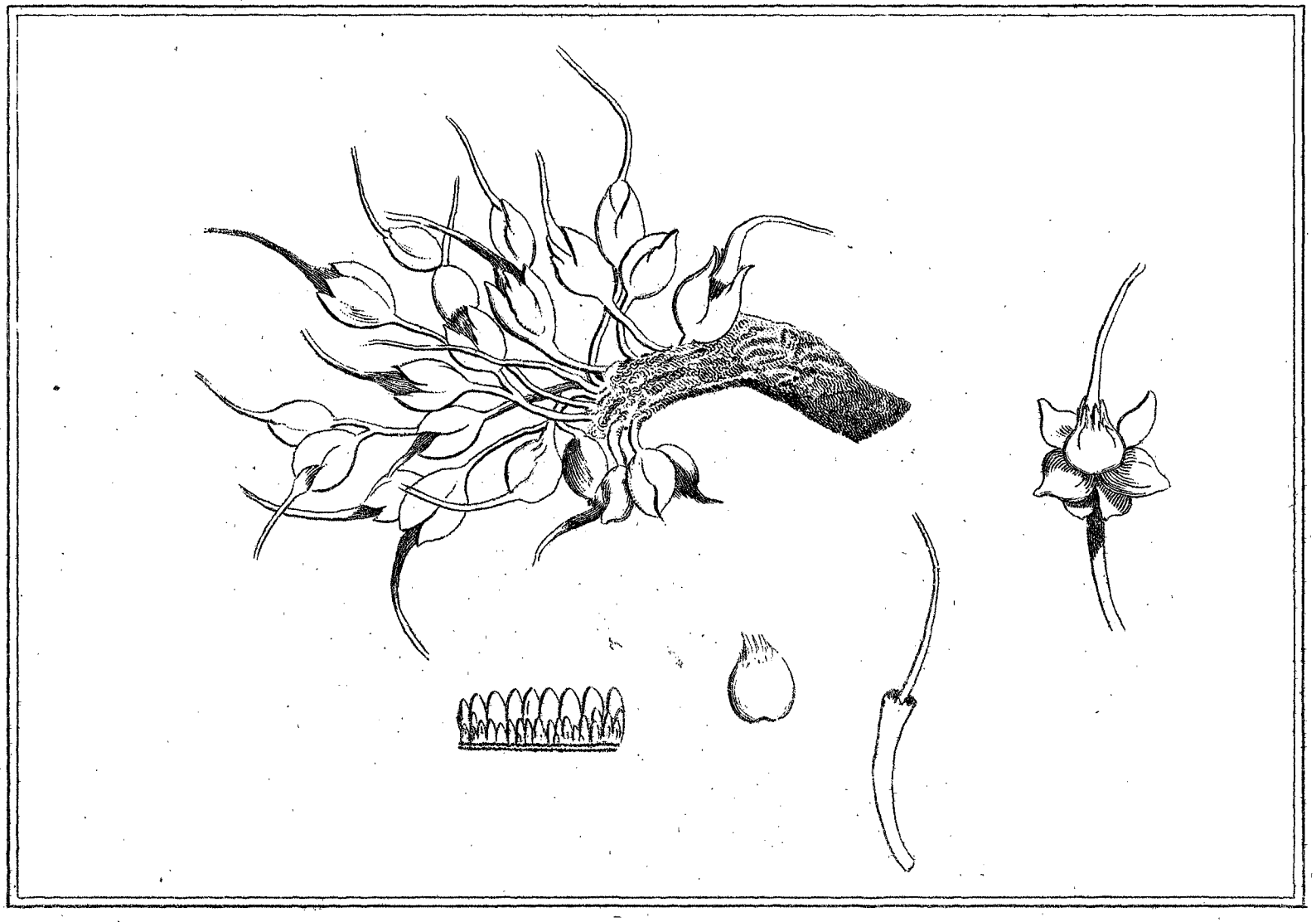
It is of the claſs of the Polyandria monogynia, of Linnæus, but of a genus not deſcribed by him.

The Calix is monophyllous, quadrifid, half divided, and imbricated in its divided part; the two oppoſite and *outer* covering, in part, the two oppoſite and *inner* parts.

The *Corolla* is monopetalous, having an inflated tube for its lower part, of near an inch long, thick, fleſhy, and of a cream colour: from this ariſe nine ſmall leaves, as it were, like petals from a Calyx, that are imbricated and twiſted, one over the other, from right to left, claſping the lower part of the ſtyle in a point; by which they ſeem to ſerve, in ſome reſpect, like a forceps, to detach the whole *Corolla* at the ſeaſon of its dropping.

There are no filaments; but the *Antheræ*, which are in number moſt commonly twenty-ſix, long, ſcabrous, and ſpear-headed, are inſerted in rows, on the inſide and upper part of the tube of the *Corolla*.

The



The Madhuca.

The ſtyle is long, round, and tapering, and projects about an inch beyond the *Corolla*; it is ſucceeded by a drupe, with a thick pericarpium, bilocular, containing two ſeeds or kernels covered with a dark brown ſkin: there are often, however, *three* of theſe, in three ſeparate diviſions.

The flowers riſe in bunches, from the extremities of the ſmaller branches: and have each a pedicle of about an inch and a half long: theſe are moſtly turned downwards, whence the Corollas more eaſily drop off.

The tree, when full grown, is about the ſize of a common *Mango-tree*, with a buſhy head and oval leaves, a little pointed; its roots ſpreading horizontally, are ſunk but little in the earth: the trunk, which is often of a conſiderable thickneſs, riſes ſeldom to any great height, without giving off branches; it is, however, not uncommon, to ſee it ſhoot up clear to the length of eight or ten feet: the wood itſelf is moderately hard, fine grained, and of a reddiſh colour.

By inciſion, the tree affords a reſinous *Gum*, from the bark.

The flowers are of a nature very extraordinary, differing eſſentially from thoſe of any other plant with which I am acquainted, as they have not in any reſpect, the uſual appearance of ſuch, but rather reſemble *berries*, and I, like many others, had long conceived them to be the *fruit* of the *Máhwah*; the tree drops its leaves in the month of February, and early in March theſe flowers begin to come out in cluſters of thirty, forty, or fifty, from the extremity of every ſmall branch; and, from this period till the latter end of April, as the flowers come to maturity (for they never open or expand) they continue falling off, with their *Antheræ*, in the mornings, a little after ſun-riſe, when they are gathered; and afterwards dried by an expoſure of a few days in the ſun: when thus prepared, they very much reſemble a dried *Grape*, both in taſte and flavour.

Immediately after the flowers drop off freſh ſhoots are made for the new leaves, which ſoon make their appearance; coming preſently to their full growth.

The fruit *(properly* ſo called) is of two ſorts in ſhape; the one reſembling a ſmall *Walnut*; the other ſomewhat larger and pointed: it is ripe towards the middle of May, and continues dropping from the tree till the whole fall; which is generally about the beginning or towards the middle of June. The outer covering, or *Pericarpium*, which is of a ſoft texture, commonly burſts in the fall, ſo that the ſeeds are very eaſily ſqueezed out of it: the ſeeds are ſomewhat of the ſhape, but longer than an *Olive*.

Theſe

Theſe ſeeds are replete with a thick *Oil*, of the conſiſtence of *Butter* or *Ghee*, which is obtained by expreſſion.

From this deſcription it may eaſily be conceived that the *Máhwah tree* and its productions are of ſingular and general uſe, eſpecially in thoſe dry and barren countries, which, from the nature of their ſituation, are not ſo well calculated for producing in plenty or perfection the other neceſſaries of life.

The *Corolla* or flowers, after being dried as before deſcribed, are eaten by the natives raw, or dreſſed with their *Curries*; and, when even ſimply boiled with rice, they afford a ſtrengthening and wholeſome nouriſhment. They are, indeed, often applied to a leſs laudable purpoſe; for being fermented, they yield, by diſtillation, a ſtrong ſpirit, which the people here ſell ſo very cheap, that for *one pice* (about a half-penny), may be purchaſed no leſs than a *Cutcha-Seer* (above a pint *Engliſh*), with which any man may get completely drunk. Theſe flowers make an article of trade; being exported from this country to *Patna* and elſewhere, in no inconſiderable quantities.

The *Oil* yielded by the fruit, as before mentioned, reſembles *Ghee* ſo much, that, being cheaper, the natives often mix it with that commodity. They uſe it, the ſame as *Ghee*, in their victuals, and in the compoſition of ſome ſorts of ſweetmeats; and burn it in their lamps: it is alſo regarded as a ſalutary remedy, applied exteriorly, to wounds, and all cutaneous eruptions. It is, at firſt, of the conſiſtence of common *Oil*, but ſoon coagulates; after being kept for ſome time, it acquires a bitteriſh taſte and rancid ſmell, which renders it ſomewhat leſs agreeable, as an article of food: but this is an inconvenience which, by the *Oil* being properly clarified and prepared at firſt, might be perhaps avoided. This *Oil* is alſo exported, both in its adulterated and original ſtate, to *Patna*, and other parts of the low country.

I do not know any purpoſe to which the *Gum* has ever been applied; but if found, upon trial, to be of uſe, it might be collected in large quantities: the beſt ſeaſon for this would be in the months of March and April, about the time the flowers come out, when the tree ſeems to be moſt replete with it; ſuch an operation, indeed, would probably diminiſh its produce in the fruit and flower; but, where it was ſufficiently cultivated, the loſs in thoſe could be but little felt.

The wood, from what has been already ſaid of it, cannot be expected to be often had in beams of any conſiderable length, ſo as to make it ſo very uſeful in building as it would otherwiſe be from its not being liable to be eat by the white ants: Mr. KEIR, however, tells me, that when he was at *Chowſee* (a village upon the *Caramnaſſa*,

naſſa, near *Buxar)*, he had beams of it which were, to the beſt of his remembrance, above twenty feet long: but, in many other reſpects, it is a moſt uſeful wood; and, as it is tough, and of a ſtrong texture, it might perhaps be employed to advantage in ſhip building, in which caſe, if properly cultivated, in many grounds that ſeem well adapted for it, and fit for little elſe, it might thus, in time, become a valuable article in that branch at *Calcutta*, whither it could eaſily be tranſported during the rainy ſeaſon, from almoſt any part of theſe countries, by ſeveral rivers that are then ſufficiently full to float it down.

The tree, I am told, will grow in the moſt barren ground, even amongſt ſtones and gravel, where there is the leaſt appearance of a ſoil; and it ſeems to deſtroy all the ſmaller trees and bruſhwood about it: yet it does not refuſe a *rich* ſoil either; Mr. KEIR having obſerved to me that the few he had ſeen about *Buxar*, where it is certainly very good, were both taller, and ſeemed to thrive much better than any he had ever met with in *Ramgur*. It does not require much *moiſture*, ſeeming to produce nearly at well in the drieſt as in moſt favourable years; and in every ſituation; and is therefore admirably fitted for the convenience of the inhabitants of theſe hilly countries, which are peculiarly ſubject to long and ſevere droughts during the hot months.

Yet, notwithſtanding its utility, and the immenſe quantity of ground that ſeems ſo well adapted to the growth of it, both here, and in the neighbouring provinces of *Catak*, *Pacheet*, *Rotas*, &c. (greateſt part of which, indeed, ſeems fit for no other uſeful production). I have myſelf never obſerved, nor can I find any of my acquaintance who ever have remarked, one ſingle tree in its infant ſtate: we can ſee, every where, *full-grown* trees in great abundance; but, never meeting with any young plants, both I and all whom I have ſpoken to on the ſubject, are at ſome loſs to conceive how they ſhould have come here: neither can the country people themſelves, of whom I have enquired, give any rational account of this: although it appears pretty evident, that numbers of them muſt have been cultivated ſome time or other, every village having many of them growing about it.

This is a circumſtance which ſufficiently marks the true character of the lower order of natives, in their moſt ſupine indolence and ſloth; owing chiefly, perhaps, to the ignorant and ſtupid rapacity of their *Rajahs*, *Zimeendars*, and other *Landholders*, and their total inattention to the welfare of thoſe dejected wretches, from whom they derive their conſequence and power: of their baſe indifference to the intereſts of thoſe whom they thus affect to hold beneath their regard many ſtriking inſtances occurred

curred to me in the courſe of my enquiries upon this very ſubject; and it was not long ago that, aſking ſome queſtions concerning the *Máhwah* of a *Zimeendar* in this neighbourhood, he anſwered that "it was the food of the *poor* people, and "how ſhould *he* know any thing about it!"

It was this ſtrange neglect of the culture of it, and a knowledge of its uſefulneſs, which firſt led me to enquire into the nature of this tree, from which the bulk of the people hereabouts already draw ſuch great benefit; in order to know whether they might not increaſe it without any great trouble to themſelves; and whether thereby the revenue might not alſo be increaſed, and a certain proviſion be made againſt famines, from which the Natives often ſuffer ſeverely in theſe higher diſtricts.

To effect this, it would be neceſſary to give the *Ryots* every poſſible encouragement to raiſe the tree from the ſeeds; but as the torpid apathy of theſe people, whether natural or acquired, will ever prevent their being moved to any exertion by a a proſpect, however alluring, of *diſtant* advantage, I apprehend the only way of bringing this about would be making the planting and raiſing of a certain number of *Máhwahs* (in proportion to the value of the tenure) an article in their *Kabooleeats* or Agreements.

The tree, as has been already obſerved, will grow almoſt any where: it ought to be ſown about the beginning of the rains, either in beds (to be afterwards tranſplanted), or, at about thirty or forty feet diſtance, in the ground deſigned for it. It is ſaid that, in ſeven years, the trees will give flowers and fruit; in ten, they will yield about half their common produce; and that, in twenty years they come to their full growth; after which, if my information be good, they will laſt near one hundred years. This account, I acknowledge, muſt neceſſarily be very vague and uncertain; as I never have met with a ſingle perſon who appeared to have had either opportunity or inclination to obſerve its progreſs: ſuch, however, is what the country people ſay of it.

I am told that a good tree will eaſily give four *puckha Maunds* (about three hundred weight avoirdupois) of dried flowers, which will ſell here for about two *Rupees*; and of ſeeds it will afford about two *Maunds*; and this, of *Oil*, will yield twenty-ſix *ſeers puckha* weight (near 60*lb.*) which, in a year like this, when *Oil* is cheap, will ſell at this place for two *Rupees* more. It is to be obſerved, however, that *every* tree will not give ſo much, neither are the flowers and *Oil* ſo clear in any part of the hills as at *Chitra*; but, allowing only a *half* of this or leſs, to be the product of each tree (though it might be rendered ſtill much greater by the very leaſt

care

care and induſtry in the cultivation of it) within the ſpace of twenty years, a ſu bſiſtence might be raiſed to the inhabitants and a conſiderable revenue to the proprietors of the lands, throughout an immenſe tract of country; the greateſt part of which, in its preſent ſtate, is little better than a barren waſte, and cannot pay one ſingle *anna* to the *Zimeendar* or the Government. That ſuch an advantage might be derived from it, may be proved by the moſt moderate calculation; for, ſuppoſing the trees to be ſown at forty feet diſtance from each other, on each *Begah* (about the third of an acre) might ſtand eight trees; and ſuppoſing the product of each tree to be only *half a Rupee*, there would be *four Rupees* of *annual value* on a *Begah* of ground; half of which going to the proprietor; it would thus give a far better rent than the generality of the beſt grounds in theſe parts; and the labourer would have a produce, without any other trouble than that of ſowing the ſeed; and fencing the ground whilſt the trees were young; and that of annually gathering the flowers, and preparing the *Oil*, when they arrive at their proper ſize: and they would probably begin to give a produce within leſs than ten years after the ſowing.

As this tree will yield nearly its uſual quantity of flowers and fruit in ſeaſons when, for want of rain, every other crop fails; if thus cultivated, it would afford the inhabitants a ſure and certain reſource, under the moſt dreadful, and what has hitherto been, to them, the moſt deſtructive, of all calamities, famine. It is well known that the rice and other ſorts of grain which form the chief part of their ſuſtenance, require a conſiderable degree of moiſture to bring them to perfection; an unuſually dry ſeaſon deſtroys the harveſt in thoſe articles, and reduces the *Ryots* in general to the utmoſt miſery; a predicament into which they could hardly fall, even in the ſevereſt dearth of grain, whilſt they had plenty of the flowers and fruit of the *Máhwah* to depend upon.

It may be here not improper to obſerve that Mr. KEIR is now ſowing a few acres with the ſeed of this uſeful tree, and means to fence it; which may, perhaps, in time, tempt others to follow ſo good an example.

Chatra, Ramgur, July 6, 1785.

XV.

OF THE METHOD OF DISTILLING, AS PRACTISED BY THE NATIVES AT CHATRA IN RAMGUR, AND IN THE OTHER PROVINCES, PERHAPS, WITH BUT LITTLE VARIATION.

By ARCHIBALD KEIR, *Eſq.*

THE body of the Still they uſe, is a common, large, unglazed, earthen, water Jar, nearly globular, of about twenty-five inches diameter at the wideſt part of it, and twenty-two inches deep to the neck, which neck riſes two inches more, and is eleven inches wide in the opening. Such, at leaſt, was the ſize of the one I meaſured; which they filled about a half with fomented *Máhwah-flowers*, that ſwam in the liquor to be diſtilled.

The Jar they placed in a Furnace, not the moſt artificial, though ſeemingly not ill adapted to give a great heat with but a very little fuel. This they made by digging a round hole in the ground, about twenty inches wide, and full three feet deep; cutting an opening in the front, ſloping down to the bottom, on the ſides perpendicular, of about nine inches wide, and fifteen long, reckoning from the circle where the Jar was to come, to ſerve to throw in the wood at, and for a paſſage to the air. On the ſide too, they cut another ſmall opening, of about four inches by three, the Jar, when placed, forming one ſide of it, to ſerve as a Chimney for the ſmoke to go out at. The bottom of the earth was rounded up like a cup. Having then placed the Jar in this, as far as it would go down, they covered it above, all round, with clay, except at the two openings, till within about a fifth of its heighth; when their furnace was completed.

In this way, I reckon, there was a full third of the ſurface of the body of the Still or Jar, expoſed to the flame, when the fire came to be lighted; and its bottom, not reaching to within two feet of where the fuel was, left a capacious hollow between them, whence the wood, that was ſhort and dry, when lighted, being moſtly converted into flame, and circulating on ſo great a ſurface of the Still, gave a much ſtronger heat than could elſe have been produced from ſo very little fuel; a conſideration well worth the attention of a manufacturer, in our country more eſpecially, where firing is ſo dear. There indeed, and particularly as coal is uſed,

it

it would be better, no doubt, to have a grate; and that the air ſhould enter from below. As to the benefit reſulting from the body of the Still being of earthen ware, I am not quite ſo clear in it. Yet, as lighter ſubſtances are well known to tranſmit heat more gradually and ſlowly, than the more ſolid, ſuch as metals; may not earthen veſſels, on this account, be leſs apt to burn their contents, ſo as to communicate an empyreumatick taſte and ſmell to the liquor that is diſtilled, ſo often, and ſo juſtly complained of, with us. At any rate, in this country, where pots are made ſo cheap, I ſhould think them greatly preferable, as, at leaſt, much leſs expenſive than thoſe which the Gentlemen, engaged in this manufacture, moſt commonly employ: though of this they are beſt able to judge.

Having thus made their Furnace, and placed the body of the Still in it, as above deſcribed, they to this luted on, with moiſtened clay, to its neck at the opening, what they here call an *Adkur*; forming with it, at once, a cover for the body of the Still, with a ſuitable perforation in it to let the vapour riſe through; and the under part of the Alembick. The *Adkur* was made with two earthen pans, having round holes in their middles, of about four inches diameter; and, their bottoms being turned oppoſite the one to the other, they were cemented together with clay; forming a neck of junction thus, of about three inches, with the ſmall riſing on the upper pan. The lowermoſt of theſe was more ſhallow, and about eleven inches wide, ſo as to cover exactly the opening at the neck of the Jar, to which they luted it on with clay. The upper and oppoſite of theſe was about four inches deep, and fourteen inches wide, with a ledge round its perforation in the middle, riſing, as is already ſaid, from the inner ſide of the neck, of about half an inch high, by which a gutter was formed to collect the condenſed ſpirit as it fell down; and from this there was a hole in the pan to let it run off by; to which hole they occaſionally luted on a ſmall hollow *Bamboo*, of about two feet and a half in length, to convey it to the receiver below. The upper pan had alſo another hole in it, of about an inch ſquare, at near a quarter of its circumference from the one below juſt ſpoken of, that ſerved to let off the water employed in cooling; as ſhall be mentioned preſently.

Their *Adkur* being thus fitted to the Jar, they completed the Alembick by taking a copper pot, ſuch as we uſe in our kitchens, of about five inches deep, eight wide at the mouth, and ten at the bottom, which was rather flattiſh; and turning its mouth downward, over the opening in the *Adkur*, luted it down on the inſide of the Jar with clay.

For

For their cooler they raiſed a ſeat, cloſe upon, and at the back part of the furnace, about a foot higher than the bottom of the copper-pot; on this they placed a two or three gallon pot, with a round hole, of about half an inch in the ſide of it; and to this hole, before they lighted their fire, they luted on a ſhort tube of a like bore; placing the pot, and directing its ſpout ſo as that, when filled with water, it threw a conſtant and uniform ſtream of it, from about a foot high, or near the center of the bottom of the copper-pot; where it was diffuſed pretty completely over its whole ſurface; and the water falling down into the upper part of the pan of the *Adkur*, it thence was conveyed through the ſquare hole already mentioned, by a trough luted on to it for that purpoſe, to a cooling reſervoir a few feet from the furnace; from which they took it up again to ſupply the upper pot as occaſion required.

As their ſtock of water, however, in this ſort of circulation, was much ſmaller than it ſeemingly ought to have been, being ſcarcely more than ſix or eight gallons, it too ſoon became hot; yet in ſpite of this diſadvantage, that ſo eaſily might have been remedied, and the ſhortneſs of the conducting tube, which had nothing but the common air to cool it, there ran a ſtream of liquor from the Still; and but very little vapour riſing from it; beyond any thing I had ever ſeen from ſtills of a much larger ſize, fitted with a worm and cooler. In about three hours' time, indeed, from their lighting of the fire, they drew off full fifteen bottles of ſpirit; which is more, by a great deal, I believe, than could have been done in our way from a Still of twice the dimenſions.

The conveniences of a worm and cooler, which are no ſmall expence either, I have myſelf often experienced; and if theſe could be avoided in ſo ſimple a way, that might eaſily be improved, the hints that are here offered may be of ſome uſe. The thin metal head is certainly well adapted, I think, to tranſmit the heat to the water, which is conſtantly renewed; and which, if cold, as it ought to be, muſt abſorb the faſteſt poſſible: whereas, in our way, the water being confined in a tub, that, from the nature of its porous ſubſtance, in a great degree rather retains than lets the heats paſs away, it ſoon accumulates in it, and becomes very hot, and though renewed pretty often, never anſwers the purpoſe of cooling the vapour in the worm, ſo expeditiouſly, and effectually, as is done by their more ſimple and leſs expenſive apparatus. In this country more eſpecially, where labour and earthen wares are ſo cheap, for as many *rupees* and leſs, twenty furnaces with ſtills and every thing belonging to them, independent of the copper pots, might very well be erected, that would yield above a hundred gallons of ſpirits a day; allowing each

ſtill

ſtill to be worked only twice: ſo very cheap, indeed, is arrack here, to the great comfort of my miners, and of many thoughtleſs people beſide, that for one ſingle *peyſa*, not two farthings ſterling, they can get a whole *Cutcha-ſeer* of it in the *Bazar*, or above a full *Engliſh* pint, and enough to make them completely intoxicated; objects often painful to be ſeen.

Of the ſuperiour excellence of metal in giving out heat from itſelf, and from vapour contained in it, we have a very clear proof, in what is daily performed on the cylinder of the ſteam engine: for cold water being thrown on it when loaded, the contained vapour is conſtantly condenſed; whence, on a vacuum being thus formed, and the weight of the atmoſphere acting on the ſurface of the piſton, attached to the arm of the balance, it is made to deſcend, and to raiſe the other arm that is fixed to the pump; while this being ſomewhat heavier, immediately ſinks again, which carries up the piſton, while the cylinder is again filled: and thus alternately by cooling and filling it, is the machine kept in motion: the power exerted in raiſing the pump arm being always in proportion to the diameter of the cylinder, or to the ſurface of the piſton, which is exactly fitted to it, and on which the preſſure acts.

The contrivance too, of having the under part of the Alembick, where the condenſed vapour is collected, or upper part of what they call the *Adkur*, of earthen ware, of ſo great a thickneſs, and of courſe at ſo great a diſtance from the heat in the body of the ſtill, is well imagined to keep the ſpirits the cooleſt poſſible when collected and running off.

By thus cooling and condenſing the vapour likewiſe ſo ſuddenly as it riſes, there is in a great meaſure a conſtant vacuum made, or as much as poſſible can be, but, that both ſteam riſes faſter, and that water boils with much leſs heat, when the preſſure is taken away from its ſurface, is an axiom in Chymiſtry too well known to need any illuſtration: it boiling in vacuum, when the heat is only ninety or ninety-five by Fahrenheit's thermometer, whereas in the open air, under the preſſure of the atmoſphere, it requires no leſs than that of two hundred and twelve, ere it can be brought to the boiling point.

I muſt further obſerve, that the ſuperiour excellence of condenſing the vapour ſo effectually and ſpeedily in the Alembick to our method of doing it on a worm and cooler, is greatly on the ſide of the former; both from the reaſons I have already adduced, and becauſe of the ſmall ſtream of vapour that can be only forced into the worm, where it is condenſed gradually as it deſcends: but above all, from the

nature of vapour itſelf, with reſpect to the heat contained in it, which of late has been proved by the very ingenious Doctor BLACK to be greater by far than, before his diſcoveries, was imagined. For vapour he has ſhewn to be in the ſtate of a new fluid, where water is diſſolved by heat; with the aſſiſtance perhaps, if I may be allowed a conjecture, of the air which it contains: and all fluids, as he has clearly demonſtated, on their becoming ſuch, abſorb a certain quantity of heat, which becomes what he very properly calls latent heat, it being heat not appearing either to the ſenſes or to the thermometer, while they remain in that liquid ſtate; but ſhowing itſelf immediately by its effects on whatever is near it, upon their changing their form from fluid to ſolid; as on water becoming ice, or metals fixing, and the like. In the ſolution of Salts alſo, there is an abſorption of heat, as we daily experience in the cooling of our liquors by diſſolving Salt-petre in water; and this he has found to be the caſe with water itſelf, and other fluids, when paſſing into a ſtate of vapour by boiling. From the moſt accurate and judicious experiments, indeed, he infers, and with the greateſt appearance of truth, that the heat thus concealed in vapour raiſed by boiling, from any given bulk of water, would be fully ſufficient, if collected in a piece of iron of the like ſize, to make it perfectly red hot. What then muſt be the effect of ſo much heat, communicated in our way of diſtilling to the worm, and to the water in the tub, will be ſufficiently evident from what has been ſaid to prove, I think, that we have hitherto employed a worſe and more defective method than we might have done with reſpect to cooling at leaſt, both in making of ſpirits, and in other diſtillations of the like kind, where a ſimilar mode is adopted.

The poor ignorant *Indian* indeed, while he with wonder ſurveys the vaſt apparatus of *European* diſtillers, in their immenſe large ſtills, worms, tubs, and expenſive furnaces, and finds that ſpirits thus made by them are more valued, and ſell much dearer than his own, may very naturally conclude, and will have his competitors join with him in opinion, that this muſt alone ſurely be owing to their better and more judicious manner of diſtilling with all thoſe ingenious and expenſive contrivances, which he can no wiſe emulate, but in this it would appear, they are both equally miſtaken; imputing the effects, which need not be controverted perhaps, to a cauſe from which they by no means proceed: the ſuperiority of their ſpirits, not at all ariſing from the ſuperiour excellence of theſe ſtills and furnaces, nor from their better mode of conducting the diſtillation in any reſpect; but chiefly rather from their greater ſkill and care in the right choice, and proper management,

of

of the materials they employ in fermentation; and above all, as I apprehend, from the vaſt convenience they have in caſks, by which, and from their abilities in point of ſtock, they are enabled, and do in fact in general keep their ſpirits for a certain time, whence they are mellowed, and improved ſurprizingly both in taſte and ſalubrity.

With reſpect to the latter improvement, I mention it more particularly here, and the more willingly alſo, as in general it ſeems to have been but too little attended to where a due attention to it might be of the greateſt uſe. For of all things that have been found grateful to the human palate, there was none ever uſed I believe, more hurtful to the body, and to the nerves eſpecially, than freſh-drawn ardent ſpirits: and this owing evidently to the principle of inflammability, of which with water they are moſtly made up, being then, in a more looſe and detached ſtate, leſs aſſimilated with the other principles than it afterwards becomes with time. By time, indeed, it is gradually not only more aſſimilated, but at length changes its nature altogether; ſo as to become, what was at firſt ſo pernicious, a benign, cooling liquor: when the ſpirit is ſtrong, the change it is true goes on more ſlow and imperceptibly; yet as a partial alteration is only wanted to mellow it for uſe, a few years keeping would be ſufficient to anſwer the purpoſe here: and whether or no it could be poſſible to prevent any other from being ſold, than that which had been kept a certain time, is well worth the conſideration of the legiſlature.

That the great noxious quality of freſh-drawn ſpirits, is chiefly owing to the cauſe I have aſſigned, a little attention, and comparing of the effects that are uniformly produced by the principle of inflammability, wherever it is met with in a looſe and weakly combined ſtate, as it is in them, will eaſily convince us of: whereas, when fully aſſimilated either in ſpirits, or with any other body, it becomes entirely inert, and uſeful, more or leſs, either for food or phyſick, according to what it happens to be united with. Thus we find it in putrid animal ſubſtances, where it lately formed part of a healthy body, being now detached, or but weakly united with air, exhibiting a moſt offenſive, and pernicious poiſon: though this abſorbed again by a living plant is preſently changed into good and wholeſome nouriſhment; to the vegetable immediately, and to any animal who may afterwards chooſe to eat it. In like manner ſulphur, which is a compound of this principle alone, united to a pure acid, the moſt deſtructive to all animal and vegetable ſubſtances, yet, it being here perfectly inert alſo, may be taken into the body with ſafety: when, if looſened either by heat or by an alkaline ſalt uniting with the acid,

acid, its noxious quality is preſently made perceivable to whoever comes within its reach.

Many other inſtances of a like nature might eaſily be added, and ſome too more appoſite perhaps than thoſe I have here mentioned; but every one's own experience, with what I have already ſaid, will ſufficiently evince the propriety, and utility of putting an entire ſtop, if poſſible, to the ſale of what ought to be ſo juſtly prohibited; and this in its conſequences, may even help to lead to other more effectual means of correcting, in a great meaſure, the cruel abuſe of ſpirits in general, that has been long ſo loudly and ſo juſtly complained of, amongſt the ſoldiers, lower *Europeans*, and our ſervants in this country; where the very worſt and indeed poiſonous ſort of them, is daily ſold at ſo very cheap a rate.

All I need further add with reſpect to diſtillation, and on the ſuperiour advantages in the mode of conducting it here to that we have been in uſe to employ, for the raiſing of ſpirits, ſimple waters, and the like, is only to obſerve, I have no ſort of doubt but that the intelligent chymical operators at home, if ever they ſhould get a hint of it, will make no manner of ſcruple to uſe it alſo, and to improve upon it greatly by a few ingenious contrivances, which their knowledge and experience will ſo eaſily ſuggeſt. The principles on which it ſeems founded indeed, eſpecially with regard to their way of cooling, are ſo ſtriking and juſt, that in many other diſtillations beſides thoſe of ſpirits and waters, they may be employed, I apprehend, with very great profit, and advantage. I ſhall now however confine myſelf to mention only the benefit that may reſult from a like proceſs in the raiſing of the finer aromaticks, while the heat contrived, as in our way, beſides impeding the diſtillation, muſt from its long action on ſuch ſubtile bodies, probably injure them greatly in the eſſential quality on which their excellence depends; and upon this very account I am apt to imagine that the greater quantity obtained, and the ſuperior quality of the *oil* of *roſes* made in this country, to that made from *roſes* with us, is owing chiefly, if not entirely, to their better and more judicious manner of extracting it here. For, with us, the ſtill, being made of metal, may in the firſt inſtance, impart too great and too ſudden a degree of heat, and next, the *oil* continuing ſo long in the vapour, and that much compreſſed, may, in ſo delicate a ſubject, not only entirely almoſt unite it with the water, ſo as to render the ſeparation impracticable, but may at the ſame time alter its eſſence, ſo completely, as that it can no longer appear in the ſtate it otherwiſe might have been found in, had the operation been better conducted, or in the way they do here. A very few trials how-

ever

ever would much better certify this than all I can poſſibly ſay on the ſubject, or in fact than all the reaſoning in the world. Therefore as to my own particular opinion of the flavour and quality of the *roſes* at home being equal if not ſuperiour to that of thoſe in this country, I may be entirely ſilent. The rules and reaſoning in chymiſtry, though ſerving greatly to enlarge and improve our underſtanding, being what of themſelves can never be depended upon till confirmed by facts and experiments; where many things often turn out very different, from what, from our beſt and moſt plauſible arguments, we had the greateſt reaſon to expect. Or, if it ſhould be found to be really true, what I have often heard aſſerted, by thoſe however who had it only from others, but not of their own particular knowledge, that, in diſtilling their *oil* of *roſes* at the places where they make it the beſt, they uſe alſo, with their *roſes*, *ſandal-wood*, and ſome other aromaticks, no *roſes*, whatſoever, it is plain, could ever of themſelves be made to afford a like *oil*; nor without ſuch an addition as they employ. A circumſtance, by the bye, that might poſſibly eaſily be certified by ſome one of the many ingenious correſpondents of the ſociety, who may happen to reſide where it is made: and a knowledge of the real truth of it would certainly be of uſe.

Chatra, December 24, 1786.

XVI.

A METHOD OF CALCULATING THE MOON'S PARALLAXES, IN LATITUDE AND LONGITUDE.

By Mr. REUBEN BURROW.

IN the Nautical Almanack for 1781, among other problems publiſhed by authority of the Board of Longitude, there is one for calculating the place of the nonageſimal degree; which is expreſsly recommended to aſtronomers as "ſuperior to all other methods for calculating eclipſes of the ſun and occultations of the ſtars:" now as a conſiderable part of that method is erroneous, and particularly in ſouth latitudes, and between the tropicks (which include the moſt of *India*) the error may therefore be

be of conſequence, and the more ſo as it is publiſhed under the ſanction of Doctor MASKELYNE, the Aſtronomer Royal: I have therefore taken the liberty of giving the following rule to ſupply its place, and in imitation of the methods of the *Hindoos*, have endeavoured to expreſs it ſo plainly, that any perſon may calculate by it, without knowing much of the ſubject.

PROBLEM.

Given the apparent time at any given place; to find the longitude and altitude of the nonageſimal degree, and alſo the parallaxes in latitude and longitude.

1. Turn the difference of longitude from *Greenwich* into time, and add it to the apparent time, if the place be to the weſt of *Greenwich*; but ſubtract if the place be to the eaſt, and the ſum, or remainder, will be the apparent time at *Greenwich*.

2. To this time calculate the ſun's right aſcenſion in time, and add it to the apparent time at the given place; the ſum is the right aſcenſion of the meridian in time.

3. From the latitude of the place by obſervation ſubtract the correction taken from page LXXV of MAYER'S Tables; the remainder is the latitude in the ſpheroid.

4. Call the right aſcenſion of the meridian in degrees AR; and, if the right aſcenſion of the meridian

Be between			then in		is an arc A			is the arc A.
0° and 90°			north	AR + 90°		but in	90° — AR	
90 and 270			north	270 — AR		ſouth	AR — 90	
270 and 360			latitude,	AR — 270		latitude,	450 — AR	

5. Let half the ſum of the colatitude of the place and the obliquity of the ecliptick be called C; and half their difference D; then add the ſecant of C, the coſine of D, and the cotangent of half A, together; the ſum (rejecting twice radius) is the tangent of an arc M; then add the coſecant of C, the ſine of D, and the cotangent of half A, together; the ſum (rejecting twice radius) is the tangent of an arc N: then if the colatitude of the place be greater than the obliquity of the ecliptic, the ſum of M and N is an angle, whoſe complement call B; but, if the colatitude be leſs than the obliquity, let the complement of the difference of M and N be called B.

6. Add the ſecant of B, the ſine of A, and the coſine of the latitude of the place, together; the ſum (rejecting twice radius) is the ſine of the altitude of the nonageſimal degree.

7. Add

7. Add the tangent of the latitude to the tangent of the obliquity of the ecliptick; the ſum is the ſine of an angle, which call X.

8. When the right aſcenſion of the meridian is

Between $\left\{\begin{array}{l}360^\circ - X \text{ and } 90^\circ \\ 90 \text{ and } 180 + X \\ 180 + X \text{ and } 270 \\ 270 \text{ and } 360 - X\end{array}\right\}$ in N. lat. $\left\{\begin{array}{l}\text{or between}\end{array}\right\}$ $\left\{\begin{array}{l}X \text{ and } 90 \\ 90 \text{ and } 180 - X \\ 180 - X \text{ and } 270 \\ 270 \text{ and } X\end{array}\right\}$ in S. lat. then $\left\{\begin{array}{l}B \\ 180 - B \\ 180 + B \\ 360 - B\end{array}\right\}$ is the longitude of the nonageſimal degree.

9. Add the moon's latitude to 90° when it is of a contrary name to the latitude of the place; but ſubtract it from 90° when it is of the ſame name; the ſum or remainder, is the moon's polar diſtance: alſo take the difference between the moon's longitude and the longitude of the nonageſimal degree; which difference call P: alſo let half the ſum of the moon's polar diſtance and altitude of the nonageſimal degree, be called Q; and half their difference, R.

10. Add the ſecant of Q, the coſine of R, and the cotangent of half P, together; the ſum is the tangent of an arc *m*; alſo add the coſecant of Q, the ſine of R, and the cotangent of half P together; the ſum is the tangent of an arc *n*.

11. If the altitude of the nonageſimal degree be greater than the moon's polar diſtance, take the ſum of the arcs *m* and *n* for the parallactick angle; but if it be leſs, take their difference.

12. Add the coſecant of the parallactick angle, the ſine of P, and the ſine of the altitude of the nonageſimal degree, together; the ſum (rejecting twice radius) is the ſine of the moon's true zenith diſtance.

13. To the ſine of the moon's true zenith diſtance add the logarithm of the horizontal parallax; the ſum (rejecting radius) is the logarithm of the parallax in altitude nearly; add the parallax, thus found, to the true zenith diſtance, and the ſum will be the corrected zenith diſtance.

14. Add the ſine of the corrected zenith diſtance, the coſine of the parallactick angle, and the logarithm of the horizontal parallax, together; the ſum (rejecting twice radius) is the logarithm of the parallax in latitude.

15. Add the logarithm of the parallax in latitude, the tangent of the parallactick angle, and the ſecant of the moon's latitude, together; the ſum (rejecting twice radius) is the logarithm of the parallax in longitude.

EXAMPLE.

"What is the altitude and longitude of the nonageſimal degree at Ludlow, whoſe lat.

lat. is 52° 23′ north, and longitude oh. 11m. weſt of *Greenwich*, 7th February, 1778, at 10h. 56′. 11″ app. time, being the time of an occultation of μ geminorum?"

Not having the Almanack for 1778, I ſhall aſſume the moon's latitude to be 0°. 51′ S. and her longitude 91°. 57′.

h	′	″		h	′	″	
10	56	11	app. time	21	27	14	⊙ AR
0	11	0	diff. long.	10	56	11	
11	7	11	app. t. *Greenwich*.	8	23	25	AR of meridian.

°	′		°			
52	23	latitude.	125	51	15	= AR
0	14	correction.	270			
52	9	reduced lat.	144	8	45	= A
37	51	colat.				
18	55	half colat.				
11	44	half obliq.				

Tang. of latitude 10.11319
Tang. of obliquity 9.63761
Sine of 34°.18′=X 9.75080

C = 30 39		secant	10.06535	cosecant	10.29261	
D = 7 11		cosine	9.99658	sine	9.09706	
½A = 72 4		cotang.	9.51005	cotang.	9.51005	
M = 20 28		tang. M.	9.57198	tang. N.	8.89972	
N = 4 32						
25	0			A=144. 9	sin.	9.76765
B = 65	0			Lat. 52. 9	cos.	9.78788
180	0			B 65. 0	sec.	10.37405

115 0 long. nonageſimal degree.

Altitude of do. 58 15 S. 9.92958

°	′	
half ☾'s polar diſt. =	45	26
half alt. non. deg. =	29	8

Q = 74 34	secant	10.57493	cosecant	10.01595	
R = 16 18	cosine	9.98218	sine	9.44819	
½P = 11 32	cotang.	10.69025	cotang.	10.69025	
m = 86 46	tang. *m.*	11.24736	tang. *n.*	10.15439	
n = 54 58					

Parallactick

Parallactick angle =	31 48	cosecant	10.27823
Alt. non. degree	58 15	- sine	9.92958
P =	23 3	- sine	9.59277
Moon's true zen. d.	39 11	- sine	9.80058
Horizon. parallax	3488	- log.	3.54258
Par. in alt. nearly	2204	- log.	3.34316
Corrected zen. dist.	39 47 44	sine	9.80628
Hor. par.		log.	3.54258
Parallactick angle		cosine	9.92936
Parallax in latitude =	1898	log.	3.27822
Parallactick angle -	-	tangent	9.79241
Moon's latitude -	0 51	secant	10.00023
Parallax in long.	1177	- log.	3.07086

When the moon is very near the ecliptick as in eclipses, the following method will be nearly exact.

1. Add the cosine of the altitude of the nonagesimal degree to the logarithm of the horizontal parallax; the sum (rejecting radius) is the logarithm of the parallax of latitude nearly: Add this parallax to the complement of the altitude of the nonagesimal degree, and call the sum the complement of the altitude of the nonagesimal degree corrected.

2. Add the cosecant of the complement of the altitude of the nonagesimal degree; the sine of the complement of the altitude of the nonagesimal degree corrected, and the logarithm of the parallax of latitude nearly, together; the sum (rejecting twice radius) is the logarithm of the parallax in latitude corrected.

3. Add the logarithm of the parallax in latitude corrected; the sine of P, and the tangent of the altitude of the nonagesimal degree, together; the sum (rejecting twice radius) is the logarithm of the parallax in longitude.

SCHOLIUM. The method of applying the parallaxes usually given requires no other correction than the following: When the pole of the ecliptick of the same name as the latitude is under the horizon, to the cotangent of the altitude of the nonagesimal degree add the cotangent of the moon's latitude; the sum is the cosine

of an angle; which added to, and ſubtracted from, the longitude of nonageſimal degree gives two longitudes, between which the Moon's latitude of a contrary name to the elevated pole is to be increaſed for the apparent latitude; but beyond thoſe longitudes the Moon's true latitude is to be increaſed by the parallax in latitude to have the apparent latitude.

REMARKS ON THE ARTIFICIAL HORIZONS, &c.

By Mr. REUBEN BURROW.

THE utility of a perfect horizon and the liableneſs of Quickſilver to be diſturbed by the leaſt wind, have induced numbers of people to invent artificial horizons of different kinds, and many of them very complicated. Some time ago having occaſion to determine the ſituation of ſeveral places by Aſtronomical Obſervations, and there being no Aſtronomical Quadrant belonging to the Company in the Settlement, I was under a neceſſity of determining the Latitudes by a Sextant; and that at a time when the Sun paſſed ſo near the Zenith as to make it impoſſible to get meridian altitudes: I therefore collected all the different artificial horizons and glaſs roofs and other contrivances for that purpoſe I could meet with; but, though they appeared correct, the reſults were very erroneous. I examined them by bringing the two limbs of the Sun, ſeen by direct viſion, to touch apparently in the teleſcope of a Sextant, and then obſerved the reflected images in Quickſilver, which ſtill appeared to touch as before; but, on examining the reflected images in the reſt of the artificial horizons, none of them appeared to touch; and the error in many was very conſiderable. I tried a number of other methods with little ſucceſs; as they were, moſtly, combinations of glaſſes: at laſt, accidentally hearing ſome officers ſpeaking of "Tents that would neither turn Sun nor Rain," I conſidered that the rays of the Sun would paſs through Cloth unrefracted; and in conſequence of this idea I applied ſome thin moſquita * curtain as a covering to the Quickſilver, and

* A kind of Silk Gauze as cloſe as Book-muſlin, and perfectly tranſparent: it is to be ſtretched over a hoop which ſtands without touching the veſſel containing the Mercury.

found

found it effectually excluded the wind and admitted the Sun; and what is of equal conſequence in this country, it totally kept away thoſe minute inſects that diſturb the ſurface of the quickſilver in obſerving; in ſhort it formed ſo complete a horizon that I could not before have hoped for any thing ſo perfect; and it is equally applicable to the ſun and ſtars.

For taking very great or very ſmall elevations of the Sun (which with the common Horizon Sextants are impracticable in the direct method), a poliſhed metalline inſtrument might be made in the form of part of a hollow obtuſe cone: this might have its axis ſet perpendicular to the Horizon at any time *by means of ſcrews* in a variety of methods; and obſervations might be made by it with great exactneſs.

In finding the latitude, when meridian obſervations cannot be taken, either there is an opportunity of taking Altitudes on both ſides of the meridian, or not: when there is not, the beſt method is to calculate the latitude from two altitudes and the time between, exactly by ſpherical trigonometry (firſt correcting the declination to the beginning and end of each interval), as the approximating methods of Dowes and others are totally inſufficient: when obſervations can be taken both before and after noon, it is beſt to take a number of altitudes in both, and then make out the equal altitudes by proportion; then having found the true time of noon by the uſual method, correct the two intervals and the declination to each time, and the latitude may be found as follows:

Add *the Coſine of the angle from noon, to the Cotangent of the declination; the ſum is the Cotangent of an arch A.*

Add *the ſine of A, the ſine of the altitude, and the arithmetical complement of the ſine of the declination, together; the ſum is the Coſine of an arch B.*

Then *the ſum or difference of A and B is the Latitude.*

As every ſingle altitude gives an independent Latitude, it is evident the Latitude may be thus found to great exactneſs.

An inſtrument might eaſily be contrived to meaſure the Sun's angle of poſition to great exactneſs, from whence the Latitude might readily be deduced; a ſmall addition to the common theodolite would be ſufficient. The variation of the azimuth near the meridian may alſo be advantageouſly applied for the ſame purpoſe.

DEMONSTRA-

DEMONSTRATION OF A THEOREM CONCERNING THE INTERSECTIONS OF CURVES.

By REUBEN BURROW, *Esq.*

IN STONE's Mathematical Dictionary is the following paragraph: "Two geometrical lines of any order will cut one another in as many points as the number expreſſes which is produced by the multiplication of the two numbers expreſſing thoſe orders:" and Mr. BRAIKONRIDGE in the preface to his *Exercitatio Geometrica de deſcriptione Curvarum* ſays: "Mr. GEORGE CAMPBELL, now Clerk of the Stores at *Woolwich*, has got a neat demonſtration of the ſame, which he hopes he will publiſh." As it does not appear that CAMPBELL ever publiſhed any thing except a paper on the roots of equations, and a ſmall treatiſe on the plagiariſms of MACLAURIN, it is very probable his demonſtration is loſt, and therefore it may not be improper to publiſh the following.

The equation of a line of the firſt order has one root, or function of the Abſciſs, for the Ordinate; of the ſecond order, two; and ſo on.

In equations for two right lines the roots may ſo vary and accommodate themſelves to each other, that the quantities expreſſing the ordinates may be equal; and as there is only one caſe where this can happen, therefore two right lines can only interſect in one point.

If a line of the firſt order be compared with a line of the ſecond; or an equation of one root with an equation of two; the root of the firſt and a ſingle root of the ſecond may ſo vary as to become equal to each other, or to form an interſection; by the ſame reaſon, the ſingle root of the firſt and the remaining root of the ſecond may each ſo vary as to become equal, or to form another interſection, and therefore a right line cuts a line of the ſecond order in two points.

If a line of the firſt order be compared with a line of the n order, it is alſo evident that the ſingle root of the firſt line, may in the ſame manner be ſo varied with each of the n roots of the ſecond line as to become equal; and therefore a right line may cut a line of the n order in n points.

Let a line of the m order be now compared with a line of the order n; then as each ſingle root of the firſt line may become equal, in the ſame manner, to every root in the ſecond; it therefore follows that for every unit in m there may be n inter-

n interſections, and as there are *m* units, there conſequently will be *mn* interſections.

The ſame method may be applied to the determination of the points, line, and ſurfaces, that ariſe from the interſections of lines, ſurfaces, and ſolids; by conſidering that the number of times that *p* may be taken from *m*, and *q* at the ſame time from *n*, will be $=\frac{m.m-1 \ldots . p, \times n.n-1 \ldots q}{1.2.3 \ldots p, \times 1.2.3 \ldots q}$

XVII.

THE PROCESS OF MAKING ATTAR, OR ESSENTIAL OIL OF ROSES.

By Lieutenant Colonel POLIER.

THE *Attar* is obtained from the Roſes by ſimple diſtillation, and the following is the mode in which I have made it. A quantity of freſh Roſes, for example forty pounds, are put in a Still with ſixty pounds of water, the Roſes being left as they are with their Calyxes, but with the ſtems cut cloſe. The maſs is then well mixed together with the hands, and a gentle fire is made under the Still; when the water begins to grow hot, and fumes to riſe, the cap of the Still is put on, and the pipe fixed; the chinks are then well luted with paſte, and cold water put on the refrigeratory at top: the receiver is alſo adapted at the end of the pipe; and the fire is continued under the Still neither too violent nor too weak. When the impregnated water begins to come over, and the Still is very hot, the fire is leſſened by gentle degrees, and the diſtillation continued till thirty pounds of water are come over, which is generally done in about four or five hours; this Roſe-water is to be poured again on a freſh quantity (forty pounds) of Roſes, and from fifteen to twenty pounds of water are to be drawn by diſtillation, following the ſame proceſs as before; the Roſe-water thus made and cohobated, will be found, if the Roſes were good and freſh, and the diſtillation carefully performed, highly

ſcented

ſcented with the Roſes. It is then poured into pans either of earthen ware or of tinned metal, and left expoſed to the freſh air for the night. The *Attar* or *Eſſence* will be found in the morning congealed, and ſwimming on the top of the water; this is to be carefully ſeparated and collected either with a thin ſhell or a ſkimmer, and poured into a vial. When a certain quantity has thus been obtained, the water and feces muſt be ſeparated from the clear eſſence, which, with reſpect to the firſt, will no be difficult to do, as the eſſence congeals with a ſlight cold, and the water may then be made to run off. If, after that, the Eſſence is kept fluid by heat, the feces will ſubſide, and may be ſeparated, but, if the operation has been neatly performed theſe will be little or none. The feces are as highly perfumed as the Eſſence, and muſt be kept, after as much of the Eſſence has been ſkimmed from the Roſe-water as could be. The remaining water ſhould be uſed for freſh diſtillations, inſtead of common water, at leaſt as far as it will go.

The above is the whole proceſs of making genuine *Attar* of Roſes. But, as the Roſes of this country give but a very ſmall quantity of Eſſence, and it is in high eſteem, various ways have been thought of to augment the quantity, though at the expence of the quality. In this country, it is uſual to add to the Roſes when put in the Still, a quantity of Sandal-wood raſpings, ſome more, ſome leſs (from one to five *tolahs*, or half ounces). The Sandal contains a deal of Eſſential Oil which comes over freely in the common diſtillation, and mixing with the Roſe-water and Eſſence, becomes ſtrongly impregnated with their perfume: the impoſition however cannot be concealed; the Eſſential Oil of Sandal will not congeal in common cold, and its ſmell cannot be kept under, but will be apparent and predominate, ſpite of every art. In *Caſhemire* they ſeldom uſe Sandal to adulterate the *Attar*, but I have been informed, to encreaſe the quantity, they diſtil with the Roſes a ſweet-ſcented graſs, which does not communicate any unpleaſant ſcent, and gives the *Attar* a high clear green colour: this Eſſence alſo does not congeal in a ſlight cold as that of Roſes.

Many other ways of adulteration have been practiſed, but all ſo groſs and palpable that I ſhall ſay nothing of them.

The quantity of Eſſential Oil to be obtained from the Roſes, is very precarious and uncertain, as it depends not only on the ſkill of the diſtiller, but alſo on the quality of the Roſes, and the favourableneſs of the ſeaſon: even in Europe where the Chemiſts are ſo perfect in their buſineſs, ſome, as TACHENIUS, obtained only half an ounce of Oil from one hundred pounds of Roſes.—HAMBERG obtained

one

one ounce from the ſame quantity; and HOFFMAN above two ounces. (N. B. the Roſes in thoſe inſtances were ſtripped of their calyxes and only the leaves uſed.) In this country nothing like either can be had, and to obtain four *Maſhas* (about one drachm and half) from eighty pounds, which, deducting the calyxes, comes to ſomething leſs than three drachms per hundred pounds of Roſe-leaves, the ſeaſon muſt be very favourable and the operation carefully performed.

In the preſent year, 1787, I had only ſixteen *Tolas* of *Attar* from fifty-four *Maunds*, twenty-three *Seers*, of Roſes, produced from a field of thirty-three *Biggahs*, or eleven *Engliſh* acres; which comes to about 2 dr. per 100 pounds. The colour of the *Attar* of Roſes is no criterion of its goodneſs, quality, or country. I have had, this year, *Attar* of a fine emerald green, of a bright yellow, and of a reddiſh hue, from the ſame ground, and obtained by the ſame proceſs, only of Roſes collected at different days.

The calyxes do not in any ſhape diminiſh the quality of the *Attar*; nor impart any green colour to it; though perhaps they may augment the quantity: but the trouble neceſſary to ſtrip them muſt, and ought to, prevent its being ever put in practice.

Lucknow, *May*, 1787.

BY MR. MACDONALD, WITH A SPECIMEN OF GOLD.

THE country of *Limong*, on the Iſland of *Sumatra*, immediately contiguous to the preſidency of *Fort Marlbrough*, and between ſeventy and eighty miles, inland, produces the fineſt gold and gold-duſt on that iſland. The *Limong* gold merchants repair, annually, to *Marlbrough*, for the purchaſe of *Opium*, and ſuch other articles as they may be in want of; in exchange for which, they give gold, of ſo pure a nature, as to contain little or no alloy. The gold is found ſometimes in duſt, and often lodged in a very hard ſtone. It is of a whitiſh colour, and reſembles that in which the veins run in the gold mines of *Tiltil* in *Chili*. The gold is extracted by beating the compound maſs in order to diſengage it from the ſtone, which flies off in ſplinters, and leaves the gold cleared of it. This is the mode uſed by a rude people;

people; by which a part of the gold muſt be loſt in the ſplinters of the ſtone, which fly off in beating the maſs. They are totally ignorant of the advantage of grinding it to a groſs powder, mixing it with quickſilver, and ſeparating the earthen and ſtony particles from thoſe of the gold, by the action of a ſtream of water on this paſte, carrying off the former, and leaving the latter precipitated to the bottom by their greater weight. They are almoſt entirely ignorant of the principles of aſſaying and amalgamation, but are extremely expert in ſeparating particles of foreign metals from gold-duſt, by a very ſuperior acuteneſs of viſion, no doubt ariſing from experience, and not a peculiar gift. They have people among them, who are gold-cleaners by occupation. The gold is found in a ſpecies of earth compoſed of a clayiſh red loam. On digging the earth, it is found to conſiſt of ſtrata (under the loam of the ſurface, commonly called ſoil) of irregular-ſhaped ſtones of a mouldering nature, mixed with a red clay, and hard pebbles mixt with a pale red clay, of a more denſe conſiſtency than that of the firſt ſtratum. The firſt ſtratum extends to a depth of three feet and a half, and the ſecond to ſomewhat leſs. The conſiſtency under theſe ſtrata is formed of either hard rock, or of gravel nearly approaching to it. The gold is found mixed with a ſtone of a hard nature, and capable of ſuſtaining a poliſh. It is found near the ſurface, and, generally, in a ſoil freeſt from ſolid rock.

The merchants, who bring the gold for ſale, are not themſelves the finders or gatherers of it, but receive it, for merchandiſe, from the *Malays* inhabiting the interior parts of the country. The native indolence of the *Malay* diſpoſition prevents them from collecting more than is ſufficient to ſupply the few and ſimple wants of a race of men, as yet, unenlightened by civilization and ſcience, and ignorant of the full extent of the advantages of the country inhabited by them. We have not, to this hour, explored a country, which, we have reaſon to ſuppoſe, produces more, or as much gold as either *Peru* or *Mexico*. This may be attributed, partly, to the difficulties incident to the undertaking, and partly, to a want of curioſity, that, indulged, might have been productive of great national and private advantages. The roads leading to this golden country are almoſt impervious; affording only a ſcanty path to a ſingle traveller, where whole nights muſt be paſſed in the open air, expoſed to the malignant influence of a hoſtile climate, in a country infeſted by the moſt ferocious wild beaſts. Theſe are circumſtances that have hitherto checked curioſity, but perſeverance and contrived precaution will ſurmount the obſtacles they furniſh, and ſuch diſcoveries might be made, as would amply compenſate for the difficulties leading to them. The gold-merchants who come from the neigh-

neighbouring and leſs rich countries, give us ſuch accounts of the facility of procuring gold, as border nearly on the marvellous, and would be altogether incredible, if great quantities of that metal produced by them did not, in a great meaſure, evince the certainty of their accounts. I have ſeen an imperfect chart of a part of the interior country, made by an intelligent native, on the ſcale of the rate of his walking, and from the reſpective ſituations of the ſun in regard to his poſition. It contained a chain of what he called Gold Mines, extending in latitude, nearly, not much leſs than three degrees. This chart is in the poſſeſſion of Mr. MILLER of the council of *Fort Marlbrough*, who did me the favour of explaining it. After making allowances for the licence of a traveller, ſome credit may be given to this chart, more eſpecially, as we are well aſſured, that that part of *Sumatra* produces large quantities of fine gold. The reſult of the whole is, that it would be a very laudable object to explore thoſe rich countries, and to eſtabliſh the working of gold-mines in them, as it could be done under a certain proſpect of advantage. The expence ariſing from clearing the country, procuring intelligence, making roads, eſtabliſhing and forming poſts of communication, and of employing profeſſional men, would, undoubtedly, be at firſt very conſiderable, but the reſulting advantages would defray theſe, and render it a matter of ſurpriſe, that a meaſure attended with ſuch obvious utility, had not been adopted at an earlier period.

It is more than probable, that *Sumatra* muſt have been the *Ophir* of SOLOMON's time. This conjecture derives no ſmall force from the word Ophir's being really a *Malay* ſubſtantive of a compound ſenſe, ſignifying a mountain containing gold. The natives have no oral or written tradition on the ſubject, excepting, that the iſland has in former times afforded gold for exportation: whether to the eaſtward or weſtward, remains an uncertainty. We have certain accounts, that the veſſels, that imported this article, were long detained, or did not return in much leſs than a year; it is therefore probable that they wintered, during the violence of the S. W. monſoon, either at Ceylon, or on the N. E. coaſt; and completed their voyages during the moderate part of the other monſoon.

XVIII.

ON THE LITERATURE OF THE HINDUS, FROM THE SANSCRIT. (COMMUNICATED BY GOVERDHAN CAUL.) WITH A SHORT COMMENTARY.——*See the Works of Sir William Jones, Vol. I. p.* 349.

TO THE PRESIDENT.

MY DEAR SIR,

I HEREWITH ſend you ſix ancient copper-plates, faſtened together by a ring in two parcels, each containing three. They were found in digging foundations for ſome new works at the fort of *Tanna*, the capital of *Salſet*. The Governor of *Bombay* informed me none of the *Gujerat Bramins* could explain the inſcriptions. I obtained permiſſion to bring them round with me, being deſirous of ſubmitting them to the inveſtigation of the ASIATICK SOCIETY, under the promiſe of reſtoring them to the proprietor.

I have the honour to be with great reſpect,
Dear Sir William,
Your moſt faithful humble ſervant,

February 15, 1787. J. CARNAC.

XIX.

AN INDIAN GRANT OF LAND IN Y. C. 1018, LITERALLY TRANSLATED FROM THE SANSCRIT, AS EXPLAINED BY RA'MALO'CHAN PANDIT, COMMUNICATED BY GENERAL CARNAC.——

See the Works of Sir William Jones, Vol. I. p. 529.

TO THE PRESIDENT.

DEAR SIR,

I DO myſelf the honour to ſend you a few remarks on *Tagara*, and beg leave to ſubmit them to your judgement: inquiries of that kind are generally very dry; and unluckily I have no talent for amplification. I have collected all I could find in the ancient authors, and endeavoured, by bringing the whole together, to elucidate a ſubject, which muſt be intereſting to the ASIATICK SOCIETY; and this, I hope, will ſecure me their indulgence. I have been as ſparing as poſſible of *Greek* quotations: I am not fond of them; however, I have ventured a few, which I thought abſolutely neceſſary. With reſpect to the hiſtorical part, you will find, I am not converſant with the *Hindu* antiquities: indeed, I have no time to ſtudy languages.

I am,
Dear Sir,
Your moſt obedient humble ſervant,

Ruſſapugla, June 19, 1787. F. WILFORD.

XX. RE-

REMARKS ON THE CITY OF TAGARA.

By Lieutenant FRANCIS WILFORD.

THE expedition of ALEXANDER having made the *Greeks* acquainted with the riches of *India*, they ſoon diſcovered the way by ſea into that country, and, having entered into a commercial correſpondence with the natives, they found it ſo beneficial, that they attempted a trade thither.

PTOLEMY PHILADELPHUS, king of *Egypt*, in order to render the means eaſy to merchants, ſent one DIONYSIUS into the ſouthern parts of *India*, to inquire into the nature of that country, its produce, and manufactures.

It was then *Tagara* began to be known to the *Greeks*, about 2050 years ago.

ARRIAN, in his *Periplus Maris Erythræi*, ſays it was a very large city, and that the produce of the country, at that early period, conſiſted chiefly of coarſe *Dungarees (Othonium vulgare)*, of which vaſt quantities were exported; muſlins of all ſorts *(Sindones omnis generis)*, and a kind of cotton ſtuff dyed of a whitiſh purple, and very much of the colour of the flowers of mallows, whence called *Molochyna*.

All kinds of mercantile goods, throughout the *Deccan*, were brought to *Tagara*, and from thence conveyed on carts to *Baroach (Barygaza)*.

ARRIAN informs us, that *Tagara* was about ten days' journey to the eaſtward of another famous mart, called *Plithana* or *Plúthana*.

That *Plúthana* was twenty days' journey to the ſouthward of *Baroach*; alſo,

That the road was through the *Balagaut* mountains.

And here we muſt obſerve, that the *Latin* tranſlation of the *Periplus** by STUCKIUS is very inaccurate and often erroneous; as in the following paſſage, where ARRIAN ſpeaking of *Tagara*, ſays

" Κατάγεται δὲ ἐξ αὐτῶν πορείαις ἁμαξῶν καὶ ἀνοδίαις μεγίσαις εἰς τὴν Βαρυγάζαν."

which STUCKIUS tranſlates thus,

" Ex his autem emporiis, *per loca invia et difficillima, res* Barygazam plauſtris *con-*
" *vehuntur*."

But it ſhould be,

* Geographiæ veteris Scriptores Græci minores. Vol. I.

" Ex

" Ex his autem emporiis, *per maximos aſcenſus*, res Barygazam *deorſum feruntur*."

Κατάγω ſignifies *deorſum ferre* (to bring down) not *convehere*.

Ανοδίαι μεγίσαι ſhould be tranſlated *per maximos aſcenſus*: Ανοδια *or* ἄνοδος in this place ſignifies *an aſcent, a road over hills*; and this meaning is plainly pointed out by the words κατάγεται and μεγίσαις.

In ſhort ἀνοδίαι μεγίσαι is the true tranſlation of the *Hindoo* word *Bala-gaut*, the name of the mountains, through which the goods from *Tagara* to *Baroach* uſed to be conveyed.

This paſſage in ARRIAN is the more intereſting, as it fixes the time when the *Bala-gaut* mountains were firſt heard of in *Europe*.

The bearing from *Tagara* to *Plúthana* is expreſsly mentioned by ARRIAN (πρὸς ἀνατολὴν) but is left out by STUCKIUS.

PLUTHANA is an important point to be ſettled, as it regulates the ſituation of *Tagara*.

It ſtill exiſts, and goes nearly by the ſame name, being called to this day *Pultanah*: it is ſituated on the ſouthern bank of the *Godávery*, about 217 Britiſh miles to the ſouthward of *Baroach*.

Theſe 217 miles, being divided by twenty, the number of days travellers were between *Pultanah* and *Baroach* according to ARRIAN, give nearly eleven miles per day, or five coſs, which is the uſual rate of travelling with heavy loaded carts.

The Onyx and ſeveral other precious ſtones are ſtill found in the neighbourhood of *Pultanah*, as related by ARRIAN; being waſhed down by torrents from the hills during the rains, according to PLINY.

ARRIAN informs us that the famous town of *Tagara* was about ten days' journey to the eaſtward of *Pultanah*.

According to the above proportion, theſe ten days (or rather ſomewhat leſs *) are equal to about 100 Britiſh miles, and conſequently *Tagara*, by its bearing and diſtance from *Pultanah*, falls at *Deogir*, a place of great antiquity, and famous through all *India* on account of the *Pagodas* of *Eloura*. It is now called *Doulet-abad* and about four coſs N. W. of *Aurungabad*.

PTOLEMY agrees very well with ARRIAN, with reſpect to diſtances and bearings, if we admit that he has miſtaken *Baithana* or *Paithana* for *Plithana*; and this, I am pretty ſure, is really the caſe, and may be eaſily accounted for, as there is very little difference between ΠΑΙΘΑΝΑ and ΠΑΙΘΑΝΑ in the *Greek* character.

* Ὡς ἡμερῶν δέκα quaſi dies decem.

Paithana

Paithana, now *Pattan* * or *Putten*, is about half way between *Tagara* and *Plithana*.

According to PTOLEMY, *Tagara* and *Pattan* were ſituated to the northward of the Baund-Ganga (*Binda* or *Bynda* river), commonly called *Godávery*: and here PTOLEMY is very right.

In Mr. BUSSY's *marches*, *Pattan* is placed to the ſouthward of the *Godávery*; but it is a miſtake.

It appears from ARRIAN's *Periplus*, that, on the arrival of the *Greeks* into the *Deccan*, above 2000 years ago, *Tagara* was the *Metropolis* of a large diſtrict called *Ariaca*, which comprehended the greateſt part of Subah *Aurangabad* and the ſouthern part of *Concan*; for the northern part of that diſtrict, including *Damaun*, *Callian*, the iſland of *Salſet*, *Bombay*, &c. belonged to the *Rajah* of *Larikeh* or *Lar*, according to ARRIAN and EBN SAÏD AL MAGREBI.

It is neceſſary to obſerve here, that, though the author of the *Periplus* is ſuppoſed to have lived about the year 160 of the preſent era, yet the materials, he made uſe of in compiling his directory, are far more ancient: for, in ſpeaking of *Tagara*, he ſays that the *Greeks* were prohibted from landing at *Callian*, and other harbours on that coaſt. Now it is well known, that, after the conqueſt of *Egypt*, the *Romans* had monopolized the whole trade to *India*, and would allow no foreigner to enter the Red Sea; and conſequently this paſſage has reference to an earlier period, previous to the conqueſt of *Egypt* by the *Romans*.

About the middle of the firſt century, *Tagara* was no longer the capital of *Ariaca*, *Rajah* SALBAHAN having removed the ſeat of the empire to *Pattan*.

PTOLEMY informs us, that *Paithana* or *Pattan* had been the reſidence of a prince of that country, whoſe name the *Greeks* have ſtrangely disfigured: we find it variouſly ſpelt, in different MSS. of PTOLEMY, *Siripolemæus*, *Siropolemæus*, *Siroptolemæus*, *&c.*

Yet when we conſider, that, whenever *Pattan* is mentioned by the *Hindoos*, they generally add, it was the reſidence of *Rajah* SALBAHAN†, who in the dialect of the *Deccan* is called *Salivanam* or *Salibanam*, I cannot help thinking, that the *Greeks* have disfigured this laſt word *Salibanam* into *Saripalam*, from which they have made *Siripolemæus*, *Siropolemæus*, *&c.*

BICKERMAJIT ruled for ſome time over the northern parts of the *Deccan*; but the *Rajahs*, headed by SALBAHAN, having revolted, they gave him battle, and he

* *Patinæ* Tab. Peutinger. *Patinna* Anonym. Ravenn. † (Making uſe of the very words of Ptolemy.)

was

was ſlain. *Tagara* became again the *Metropolis* of *Ariaca*; at leaſt it was ſo towards the latter end of the eleventh century, as it appears from a grant of ſome lands in *Concan*, made by a *Rajah* of *Tagara*: this grant ſtill exiſts, and was communicated to the ASIATICK SOCIETY by General CARNAC.

When the *Muſſulmans* carried their arms into the *Deccan* about the year 1293, *Tagara* or *Deoghir* was ſtill the reſidence of a powerful *Rajah*, and remained ſo till the time of SHAH-JEHAN, when the diſtrict belonging to it became a *Subah* of the *Mogul* empire. Then *Tagara* was deſerted, and *Kerkhi*, four coſs to the ſouth-eaſt of it, became the capital: this place is now called *Aurungabad*.

Thus was deſtroyed the ancient kingdom or *Rajaſhip* of *Tagara*, after it had exiſted with little interruption above 2000 years: that is to ſay, as far as we can trace back its antiquity.

It may appear aſtoniſhing, that though the *Rajah* of *Tagara* was poſſeſſed of a large tract on the ſea coaſt, yet all the trade was carried on by land.

Formerly it was not ſo. On the arrival of the *Greeks* into the *Deccan*, goods were brought to *Callihan*, near *Bombay*, and then ſhipped off. However, a *Rajah* of *Larikeh*, or *Lar*, called *Sandanes*, according to ARRIAN, would no longer allow the *Greeks* to trade either at *Callian*, or at the harbours belonging to him on that coaſt, except *Baroach*; and whenever any of them were found at *Callian* or in the neighbourhood, they were confined and ſent to *Baroach* under a ſtrong guard. ARRIAN, being a *Greek* himſelf, has not thought proper to inform us what could induce the *Rajah* to behave in this manner to the *Greeks*; but his ſilence is a convincing proof that they had behaved amiſs; and it is likely enough that they had attempted to make a ſettlement in the iſland of *Salſet*, in order to make themſelves independent, and facilitate their conqueſts into the *Deccan*.

The fears of the *Rajah* were not groundleſs; for the *Greek* kings of *Bactriana* were poſſeſſed of the *Punjab*, *Cabul*, &c. in the north of *India*.

There were other harbours, to the ſouth of *Callian*, belonging to the *Rajah* of *Tagara*, but they were not frequented, on account of *Pirates*, who, according to PLINY, ARRIAN and PTOLEMY, infeſted theſe countries, in the very ſame manner they do now.

XX.

ON THE PANGOLIN OF BAHAR. *See the Works of Sir William Jones, Vol. I. p. 545.*

XXI.

INSCRIPTIONS ON THE STAFF OF FI'RU'Z SHAH. TRANSLATED FROM THE SANSCRIT, AS EXPLAINED BY RA'DHA'CA'NTA SARMAN. *See the Works of Sir William Jones, Vol. I. p. 539.*

XXII.

A CONVERSATION WITH ABRAM, AN ABYSSINIAN, CONCERNING THE CITY OF GWENDER AND THE SOURCES OF THE NILE. BY THE PRESIDENT. *See the Works of Sir William Jones, Vol. I. p. 515.*

ON THE COURSE OF THE NILE. *See the Works of Sir William Jones, Vol. I. p. 519.*

XXIII.

ON THE TRIAL BY ORDEAL, AMONG THE HINDUS.—BY ALI IBRA'HI'M KHA'N, CHIEF MAGISTRATE AT BANA'RES.

Communicated by WARREN HASTINGS, *Eſq.*

THE modes of trying offenders by an appeal to the Deity, which are deſcribed at large in the *Mitácſherá*, or Comment on the *Dherma Saſtra* in the *Chapter of Oaths*, and other ancient books of *Hindu* law, are here ſufficiently explained, according to the interpretation of learned *Pandits*, by the well-wiſher to mankind, ALI' IBRA'HI'M KHA'N.

The word *Dívya* in *Sanſcrit* ſignifies the ſame with *paríchhá*, or *parikhyà* in *Bháſhà*, *kaſam* in *Arabick*, and *ſaucand* in *Perſian*; that is, an *oath*; or the form of invoking the ſupreme Being to atteſt the truth of an allegation; but it is generally underſtood to mean the trial by *Ordeal*, or the form of appealing to the *immediate* interpoſition of the divine power.

Now this trial may be conducted in *nine* ways: firſt, by the *balance*; ſecondly, by *fire*; thirdly, by *water*; fourthly, by *poiſon*; fifthly, by the *Cóſha*, or water in which an idol has been waſhed; ſixthly, by *rice*; ſeventhly, by *boiling oil*; eighthly, by *red-hot iron*; ninthly, by *images*.

I. Ordeal by the balance is thus performed. The beam having been previouſly adjuſted, the cord fixed, and both ſcales made perfectly even, the perſon accuſed and a *Pandit* faſt a whole day; then, after the accuſed has been bathed in ſacred water, the *hóma*, or *oblation* preſented to *fire*, and the deities worſhipped, he is carefully weighed; and, when he is taken out of the ſcale, the *Pandits* proſtrate themſelves before it, pronounce a certain *mentra* or *incantation*, agreeably to the *Sáſtras*, and, having written the ſubſtance of the accuſation on a piece of paper, bind it on his head. Six minutes after, they place him again in the ſcale; and, if he weigh more than before, he is held guilty; if leſs, innocent; if exactly the ſame, he muſt be weighed a third time; when, as it is written in the *Mitácſherá*, there will certainly be a difference in his weight. Should the balance, though well fixed, break down, this would be conſidered as a proof of his guilt.

II. For

II. For the *fire-ordeal*, an excavation, nine hands long, two ſpans broad, and one ſpan deep, is made in the ground, and filled with a fire of *pippal* wood: into this the perſon accuſed muſt walk bare-footed; and, if his foot be unhurt, they hold him blameleſs; if burned, guilty.

III. WATER-ORDEAL is performed by cauſing the perſon accuſed to ſtand in a ſufficient depth of water, either flowing or ſtagnant, to reach his navel; but care ſhould be taken, that no ravenous animal be in it, and that it be not moved by much air: a *Bráhman* is then directed to go into the water, holding a ſtaff in his hand; and a ſoldier ſhoots three arrows on dry ground from a bow of cane: a man is next diſpatched to bring the arrow which has been ſhot fartheſt; and, after he has taken it up, another is ordered to run from the edge of the water; at which inſtant the perſon accuſed is told to graſp the foot or the ſtaff of the *Bráhman*, who ſtands near him in the water, and immediately to dive into it. He muſt remain under water, till the two men, who went to fetch the arrows, are returned; for, if he raiſe his head or body above the ſurface, before the arrows are brought back, his guilt is conſidered as fully proved. In the villages near *Benáres* it is the practice for the perſon, who is to be tried by this kind of *Ordeal*, to ſtand in water up to his navel, and then, holding the foot of a *Bráhman*, to dive under it as long as a man can walk fifty paces very gently: if, before the man has walked thus far, the accuſed riſe above the water, he is condemned; if not, acquitted.

IV. There are two ſorts of trial by *poiſon*; firſt, the *Pandits* having performed their *hóma*, and the perſon accuſed his ablution, two *retti's* and a half, or ſeven barley-corns, of *viſhanága*, a poiſonous root, or of *ſanc'hyá*, that is, white arſenick, are mixed in eight *máſha's*, or ſixty-four *retti's*, of clarefied *butter*, which the accuſed muſt eat from the hand of a *Bráhman*: if the poiſon produce no viſible effect, he is abſolved; otherwiſe, condemned. Secondly, the hooded ſnake, called *nága*, is thrown into a deep earthen pot, into which is dropped a ring, a ſeal, or a coin: this the perſon accuſed is ordered to take out with his hand; and, if the ſerpent bite him, he is pronounced guilty; if not, innocent.

V. Trial by the *Cóſha* is as follows: the accuſed is made to drink three draughts of the water, in which the images of the *Sun*, of *Dévì*, and other deities, have been waſhed for that purpoſe; and if, within fourteen days, he has any ſickneſs or indiſpoſition, his crime is conſidered as proved.

VI. When ſeveral perſons are ſuſpected of theft, ſome dry rice is weighed, with the ſacred ſtone, called *Sálgrám*; or certain *Slócas* are read over it; after which

the ſuſpected perſons are ſeverally ordered to chew a quantity of it: as ſoon as they have chewed it, they are to throw it on ſome leaves of *pippal*, or, if none be at hand, on ſome *b'húrja patra*, or bark of a tree from *Népál* or *Caſhmír*. The man, from whoſe mouth the rice comes dry or ſtained with blood, is holden guilty; the reſt are acquitted.

VII. The ordeal by *hot oil* is very ſimple: when it is heated ſufficiently, the accuſed thruſts his hand into it; and if he be not burned, is held innocent.

VIII. In the ſame manner, they make an *iron ball*, or the *head of a lance*, red-hot, and place it in the hands of the perſon accuſed; who if it burn him not, is judged guiltleſs.

IX. To perform the ordeal by *hdharmárch*, which is the name of the *ſlóca* appropriated to this mode of trial, either an image, named *Dharma*, or the Genius of Juſtice, is made of ſilver, and another, called *Adharma*, of clay or iron, both of which are thrown into a large earthen jar, and the accuſed, having thruſt his hand into it, is acquitted, if he bring out the ſilver image, but condemned, if he draw forth the iron; or, the figure of a deity is painted on white cloth, and another on black; the firſt of which they name *dharma*, and the ſecond *adharma*: theſe are ſeverally rolled up in cow-dung, and thrown into a large jar without having ever been ſhown to the accuſed: who muſt put his hand into the jar, and is acquitted or convicted, as he draws out the figure on white, or on black, cloth.

It is written in the comment on the *Dherma Sáſtra*, that each of the four principal caſts has a ſort of ordeal appropriated to it; that a *Bráhman* muſt be tried by the *balance*, a *Cſhatriya* by *fire*, a *Vaiſya* by *water*, and a *Súdra* by *poiſon*; but ſome have decided, that any ordeal, except that by poiſon, may be performed by a *Bráhman*, and that a man of any caſt may be tried by the *balance*: it has been determined, that a woman may have any trial except thoſe by poiſon and by water.

Certain months and days alſo are limited in the *Mitácſherá* for the different ſpecies of ordeal, as *Agrahan*, *Pauſh*, *Mágh*, *P'hálgun*, *Sráwan*, and *B'hádr* for that by *fire*, *A'ſwin*, *Cártic*, *Jaiſht*, and *A'ſhádh*, for that by water, *Pauſh*, *Mágh*, and *P'hálgun*, for that by *poiſon*; and regularly there ſhould be no *water-ordeal* on the *Aſhtemi*, or *eighth*, the *Cheturdaſi*, or *fourteenth*, day of the new or full moon, in the intercalary month, in the month of *B'hádr*, on *Sanaiſcher*, or *Saturday*, and on *Mangal*, or *Tueſday*; but, whenever the magiſtrate decides that there ſhall be an ordeal, the regular appointment of months and days needs not be regarded.

The

The *Mitácſherà* contains alſo the following diſtinctions; in caſes of theft or fraud to the amount of a *hundred* gold mohrs the trial by *poiſon* is proper; if *eighty* mohrs be ſtolen the ſuſpected perſon may be tried by *fire*; if *forty*, by the *balance*; if from *thirty* to *ten*, by the *image-water*; if two only, by *rice*.

An inſpired legiſlator, named *Cátyáyana*, was of opinion, that, though a theft or fraud could be proved by witneſſes, the party accuſed might be tried by ordeal: he ſays too, that, where a thouſand *pana's* are ſtolen or fraudulently withheld, the proper trial is by *poiſon*; where *ſeven hundred and fifty*, by *fire*; where *ſix hundred* and *ſixty-ſix*, and a fraction, by *water*; where *five hundred* by the *balance*; where *four* hundred, by *hot oil*; where *three* hundred, by *rice*; where an *hundred and fifty*, by the *Cóſha*; and where *one* hundred, by the *dharmárch*, or images of ſilver and iron.

The mode of conducting the ordeal by red-hot *balls*, or *heads of ſpears*, *is* thus particularly deſcribed in the commentary on *Yágyawelcya*.

At daybreak, the place, where the ceremony is to be performed, is cleared and waſhed in the cuſtomary form; and at ſun-riſe, the *Pandits*, having paid their adoration to GANESA, the God of Wiſdom, draw nine circles on the ground with cow-dung, at intervals of ſixteen fingers; each circle containing ſixteen fingers of earth, but the ninth either ſmaller or larger than the reſt: then they worſhip the deities in the mode preſcribed by the *Sáſtra*, preſent oblations to the Fire, and, having a ſecond time worſhipped the Gods, read the appointed *mentra's*. The perſon to be tried then performs an ablution, puts on moiſt clothes, and, turning his face to the Eaſt, ſtands in the *firſt* ring, with both his hands fixed in his girdle: after this the preſiding magiſtrate and *Pandits* order him to rub ſome rice in the huſk between his hands, which they carefully inſpect; and, if the ſcar of a former wound, a mole, or other mark, appear on either of them, they ſtain it with a dye, that, after the trial, it may be diſtinguiſhed from any new mark. They next order him to hold both his hands open and cloſe together; and, having put into them ſeven leaves of the *trembling* tree, or *pippal*, ſeven of the *ſami* or *jend*, ſeven blades of *darbha* graſs, a little barley moiſtened with curds, and a few flowers, they faſten the leaves on his hand with ſeven threads of raw cotton. The *Pandits* then read the *ſlócas*, which are appointed for the occaſion; and, having written a ſtate of the caſe and the point in iſſue on a palmyra-leaf, together with the *mentra* preſcribed in the *Véda*, they tie the leaf on the head of the accuſed. All being prepared, they heat an iron ball or the head of a lance, weighing two *ſér* and a half, or five *pounds*, and throw

throw it into water; they heat it again, and again cool it in the ſame manner: the third time they keep it in the fire till it is red-hot; then they make the perſon accuſed ſtand in the firſt circle; and, having taken the iron from the fire and read the uſual incantation over it, the *Pandits* place it with tongs in his hands. He muſt ſtep gradually from circle to circle, his feet being conſtantly within one of them, and when he has reached the *eighth*, he muſt throw the iron into the *ninth*, ſo as to burn ſome graſs, which muſt be left in it for that purpoſe. This being performed, the magiſtrate and *Pandits* again command him to rub ſome rice in the huſk between both his hands, which they afterwards examine; and, if any mark of burning appear on either of them, he is convicted; if not, his innocence is conſidered as proved. If his hand ſhake through fear, and by his trembling any other part of his body is burned, his veracity remains unimpeached; but if he let the iron drop before he reach the *eighth* circle, and doubt ariſe in the minds of the ſpectators, whether it had burned him, he muſt repeat the whole ceremony from the beginning.

In the year of the MESSIAH, 1783, a man was tried by the *hot ball* at *Benáres*, in the preſence of me ALI IBRA'HIM KHA'N, on the following occaſion. A man had appealed one SANCAR of larceny, who pleaded that he was not guilty; and, as the theft could not be proved by legal evidence, the trial by fire-ordeal was tendered to the appellee, and accepted by him. This well-wiſher to mankind adviſed the learned magiſtrates and *Pandits* to prevent the deciſion of the queſtion by a mode not conformable to the practice of the Company's Government, and recommended an oath by the water of the *Ganges* and the leaves of *tulaſi* in a little veſſel of braſs, or by the book *Herivanſa*, or the ſtone *Sálgrám* or by the hallowed ponds or baſons; all which oaths are uſed at *Benáres*. When the parties obſtinately refuſed to try the iſſue by any one of the modes recommended, and inſiſted on a trial by the hot ball, the magiſtrates and *Pandits* of the court were ordered to gratify their wiſhes, and, ſetting aſide thoſe forms of trial, in which there could be only a diſtant fear of death, or loſs of property, as the juſt puniſhment of perjury by the ſure, yet ſlow, judgment of heaven, to perform the ceremony of ordeal agreeably to the *Dherma Sáſtra*: but, it was not till after mature deliberation for four months, that a regular mandate iſſued for a trial by the red-hot ball; and this was at length granted for four reaſons; firſt, becauſe there was no other way of condemning or abſolving the perſon accuſed; ſecondly, becauſe both parties were *Hindus*, and this mode of trial was ſpecially appointed in the *Dherma Sáſtra* by the ancient lawgivers;

lawgivers; thirdly, becauſe this ordeal is practiſed in the dominions of the *Hindu Rájás*; and fourthly, becauſe it might be uſeful to inquire how it was poſſible for the heat of fire to be reſiſted, and for the hand, that held it, to avoid being burned. An order was accordingly ſent to the *Pandits* of the court and of *Benáres* to this effect: "Since the parties accuſing and accuſed are both *Hindus*, and will not con-"ſent to any trial but that by the hot ball, let the ordeal deſired be duly performed "in the manner preſcribed by the *Mitácſherá*, or commentary on YA'GYA-"WALCYA."

When preparations were made for the trial, this well-wiſher to mankind, attended by all the learned profeſſors, by the officers of the court, the *Sipáhis* of Captain HOGAN'S battalion, and many inhabitants of *Benáres*, went to the place prepared, and endeavoured to diſſuade the appellor from requiring the accuſed to be tried by fire, adding: "If his hand be not burned, you ſhall certainly be im-"priſoned." The accuſer, not deterred by this menace, perſiſted in demanding the trial. The ceremony, therefore, was thus conducted in the preſence of me ALI IBRAHI'M KHA'N.

The *Pandits* of the court and the city, having worſhipped the God of *Knowledge*, and preſented their oblation of clarified butter to the Fire, formed nine circles of cow-dung on the ground; and, having bathed the appellee in the *Ganges*, brought him with his clothes wet; when, to remove all ſuſpicion of deceit, they waſhed his hands with pure water: then, having written a ſtate of the caſe and the words of the *mentra* on a palmyra-leaf, they tied it on his head: and put into his hands, which they opened and joined together, ſeven leaves of *pippal*, ſeven of *jend*, ſeven blades of *darbha* graſs, a few flowers, and ſome barley moiſtened with curds, which they faſtened with ſeven threads of raw white cotton. After this they made the iron ball red-hot, and, taking it up with tongs, placed it in his hands: he walked with it ſtep by ſtep, the ſpace of three *gaz* and a half, through each of the *ſeven* intermediate rings, and threw the ball into the *ninth*, where it burnt the graſs, that had been left in it. He next, to prove his veracity, rubbed ſome rice in the huſk between his hands; which were afterwards examined, and were ſo far from being burned, that not even a bliſter was raiſed on either of them. Since it is the nature of fire to burn, the officers of the court, and people of *Benáres*, near five hundred of whom attended the ceremony, were aſtoniſhed at the event; and this well-wiſher to mankind was perfectly amazed. It occurred to his weak apprehenſion, that probably the freſh leaves and other things, which as it has been mentioned, were placed on the hands of the accuſed,

cuſed, had prevented their being burned; beſides that the time was but ſhort between his taking the ball and throwing it down: yet it is poſitively declared in the *Dherma Sáſtra*, and in the written opinions of the moſt reſpectable *Pandits*, that the hand of a man who ſpeaks truth cannot be burned; and ALI IBRA'HIM KHA'N certainly ſaw with his own eyes, as many others alſo ſaw with theirs, that the hands of the appellee in this cauſe were unhurt by the fire: he was conſequently diſcharged; but, that men might in future be deterred from demanding the trial by ordeal, the appellor was committed for a week. After all, if ſuch a trial could be ſeen once or twice by ſeveral intelligent men, acquainted with natural philoſophy, they might be able to aſſign the true reaſon, why a man's hand may be burned in ſome caſes, and not in others.

Ordeal by the veſſel of hot oil, according to the comment on the *Dherma Sáſtra* is thus performed: the ground, appointed for the trial, is cleared and rubbed with cow-dung, and, the next day at ſun-riſe, the *Pandit* worſhips GANE'SA, preſents his oblations, and pays adoration to other deities, conformably to the *Sáſtra:* then, having read the incantation preſcribed, he places a round pan of gold, ſilver, copper, iron, or clay, with a diameter of ſixteen fingers, and four fingers deep; and throws into it one *ſér*, or eighty *ſicca* weight, of clarified butter or oil of *ſeſamum*. After this a ring of gold or ſilver, or iron, is cleaned and waſhed with water, and caſt into the oil; which they proceed to heat, and, when it is very hot, put into it a freſh leaf of *pippala*, or of *bilwa:* when the leaf is burned, the oil is known to be ſufficiently hot. Then, having pronounced a *mentra* over the oil, they order the party accuſed to take the ring out of the pan; and, if he take it out without being burned or without a bliſter on his hand, his innocence is conſidered as proved; if not, his guilt.

A *Bráhman*, named RISHI'SWARA BHATTA accuſed one RA'MDAYA'L, a linen painter, of having ſtolen his goods: RA'MDAYA'L pleaded not guilty; and, after much altercation, conſented to be tried, as it had been propoſed, by the veſſel of oil. This well-wiſher to mankind adviſed the *Pandits* of the court to prevent, if poſſible, that mode of trial; but, ſince the parties inſiſted on it, an ordeal by hot oil, according to the *Sáſtra*, was awarded for the ſame reaſons, which prevailed in regard to the trial by the ball. The *Pandits*, who aſſiſted at the ceremony, were BHI'SHMA BHATTA, NA'NA'PA'T'HAC, MANIRA'MA *Pát'haca*, MENIRA'MA BHATTA, SIVA, ANANTARA'MA BHATTA, CRIPA'RA'MA, VISHNUHERI, CRISHNACHANDRA, RA'ME'NDRA, GO'VINDARA'MA, HERICRISHNA BHATTA, CA'LIDA'SA:

DA'SA: the three laſt were *Pandits* of the court. When GANE'SA had been worſhipped and the *hóma* preſented, according to the *Sáſtra*, they ſent for this well-wiſher to mankind; who, attended by the two *Dárógbas* of the *Dívání* and *Faujdári* courts, the *Cotwál* of the town, the other officers of the court, and moſt of the inhabitants of *Benáres*, went to the place of trial; where he laboured to diſſuade RA'MDAYA'L and his father from ſubmitting to the ordeal; and apprized them, that, if the hand of the accuſed ſhould be burned, he would be compelled to pay the value of the goods ſtolen, and his character would be diſgraced in every company. RA'MDAYA'L would not deſiſt: he thruſt his hand into the veſſel, and was burned. The opinion of the *Pandits* was then taken; and they were unanimous, that, by the burning of his hand, his guilt was eſtabliſhed, and he bound to pay RISHI'SWARA BHATTA the price of what he had ſtolen; but, if the ſum exceeded five hundred *aſhraſi's*, his hand muſt be cut off by an expreſs law in the *Sáſtra*; and a mulct alſo muſt be impoſed on him according to his circumſtances.

The chief magiſtrate, therefore, cauſed RA'MDAYA'L to pay RISHI'SWARA ſeven hundred rupees in return for the goods, which had been ſtolen; but, as amercements in ſuch caſes are not uſual in the courts of judicature at *Benáres*, the mulct was remitted, and the priſoner diſcharged.

The record of this conviction was tranſmitted to *Calcutta* in the year of the MESSIAH 1783; and, in the month of *April*, 1784, the Governor General, IMA'DU'DDAU'LAH JELA'DET JANG BEHA'DER, having ſeen the preceding account of trials by ordeal, put many queſtions concerning the meaning of *Sanſcrit* words, and the caſes here reported; to which he received reſpectful anſwers. He firſt deſired to know the preciſe meaning of *hóma*, and was informed that it meant the oblations made to pleaſe the deities, and compriſed a variety of things: thus in the *agni hóma*, they throw into the *fire* ſeveral ſorts of wood and graſs, as *palás* wood, *c'hadira* wood, *racta chandan* or red ſandal, *pippal-wood*, *ſami*, and *cuſha* graſs, *dubba*, together with ſome ſorts of grain, fruit and other ingredients, as black ſeſamum, *barley*, *rice*, *ſugar-cane*, *clariſied butter*, *almonds*, *dates*, and *gúgal* or *bdellium*. To his next queſtion, "how many ſpecies of *hóma* there were?" it was anſwered, that different ſpecies were adapted to different occaſions: but that, in the ordeals by hot iron, and hot oil, the ſame ſort of oblation was uſed. When he deſired to know the meaning of the word *mentra*, he was reſpectfully told, that in the language of the *Pandits*, there were three ſuch words, *mentra*, *yantra*, and *tantra*; that the *firſt* meant a paſſage from one of the *Védas*, in which the names of certain deities occurred; the

ſecond,

ſecond, a ſcheme of figures, which they write with a belief that their wiſhes will be accompliſhed by it; and the third, a medical preparation, by the uſe of which all injuries may be avoided; for they are ſaid to rub it on their hands, and afterwards to touch red-hot iron without being burned. He then aſked, how much barley, moiſtened with curds, was put into the hands of the accuſed perſon; and the anſwer was, *nine grains*.

His other queſtions were thus anſwered: "that the leaves of *pippala* were ſpread about in the hands of the accuſed, not heaped one above another; that the man, who performed the fire ordeal, was not much agitated, but ſeemed in full poſſeſſion of his faculties; that the perſon tried by hot oil was at firſt afraid, but perſiſted, after he was burned, in denying the theft; nevertheleſs, as he previouſly had entered into a written agreement, that, if his hand ſhould be hurt, he would pay the value of the goods, the magiſtrate for that reaſon thought himſelf juſtified in compelling payment; that, when the before-mentioned ingredients of the *hóma* were thrown into the fire, the *Pandits*, ſitting round the *hearth*, ſung the Védas preſcribed in the *Sáſtra*. That the form of the hearth is eſtabliſhed in the [illegible] in the *Dherma Sáſtra*; and this fire-place is alſo called *Védi*; that, for the [illegible] oblations, they raiſe a little ground for the *hearth*, and kindle fire on it; for the higher oblations, they ſink the ground to receive the fire, where they perform the *hóma*, and this ſacred hearth they call *cunda*." The Governor then aſked, why the trials by fire, by the hot ball, and the veſſel of oil, if there be no eſſential difference between them, are not all called fire-ordeals; and it was humbly anſwered, that, according to ſome *Pandits*, they were all three different, whilſt others inſiſted, that the trial by fire was diſtinct from that by the veſſel, though the trial by the hot ball and the head of a lance were the ſame; but that, in the apprehenſion of his reſpectful ſervant, they were all *ordeals by fire*.

THE INDIAN LAW OF ORDEAL, VERBALLY TRANSLATED FROM YA'GYAWALCYA.

1. THE balance, fire, water, poiſon, the idol—theſe are the ordeals uſed here below for the proof of innocence, when the accuſations are heavy, and when the accuſer offers to hazard a mulct (if he ſhould fail):

2. Or

2. Or one party may be tried, if he pleaſe, by ordeal, and the other muſt then riſque an amercement; but the trial may take place even without any wager, if the crime committed be injurious to the prince.

3. The ſovereign, having ſummoned the accuſed, while his clothes are yet moiſt from bathing at ſunriſe, before he has broken his faſt, ſhall cauſe all trials by ordeal to be conducted in the preſence of *Bráhmans*.

4. The balance is for women, children, old men, the blind, the lame, *Bráhmans*, and the ſick; for the *Súdra*, fire or water, or ſeven barley-corns of poiſon.

5. Unleſs the loſs of the accuſer amount to a thouſand pieces of ſilver, the accuſed muſt not be tried by the red-hot ball, nor by poiſon, nor by the ſcales; but, if the offence be againſt the king, or if the crime be heinous, he muſt acquit himſelf by one of thoſe trials in all caſes.

6. He, who has recourſe to the balance, muſt be attended by perſons experienced in weighing, and go down into one ſcale, with an equal weight placed in the other, and a groove (with water in it) marked on the beam.

7 "Thou, O balance, art the manſion of truth; thou waſt anciently contrived "by deities: declare the truth, therefore, O giver of ſucceſs, and clear me from all "ſuſpicion.

8. "If I am guilty, O venerable as my own mother, then ſink me down; but "if innocent, raiſe me aloft." Thus ſhall he addreſs the balance.

9. If he ſink, he is convicted, or if the ſcales be broken; but, if the ſtring be not broken, and he riſe aloft, he muſt be acquitted.

10. On the trial by fire, let both hands of the accuſed be rubbed with rice in the huſk, and well examined: then let ſeven leaves of the *Aſwatt'ha* (the religious fig-tree) be placed on them, and bound with ſeven threads.

11. "Thou, O fire, pervadeſt all beings; O cauſe of purity, who giveſt evidence "of virtue and ſin, declare the truth in this my hand."

12. When he has pronounced this, the prieſt ſhall place in both his hands an iron ball, red hot, and weighing fifty * *pala's*.

13. Having taken it, he ſhall ſtep gradually into ſeven circles, each with a diameter of ſixteen fingers, and ſeparated from the next by the ſame ſpace.

14. If, having caſt away the hot ball, he ſhall again have his hands rubbed with rice in the huſk, and ſhall ſhow them unburned, he will prove his innocence.

* A *pala* is four *carſha's*, and a *carſha*, eighty *raćticà's*, or ſeeds of the *Gungà* creeper, each weighing above a grain and a quarter, or, correctly, $1\frac{5}{16}$ gr.

Should the iron fall during the trial, or ſhould a doubt ariſe (on the regularity of the proceedings), he muſt be tried again.

15. "Preſerve me, O Varuna, by declaring the truth." Thus having invoked the God of waters, the accuſed ſhall plunge his head into the river or pool, and hold both thighs of a man, who ſhall ſtand in it up to his navel.

16. A ſwift runner ſhall then haſten to fetch an arrow ſhot at the moment of his plunging; and if, while the runner is gone, the prieſt ſhall ſee the head of the accuſed under water, he muſt be diſcharged as innocent.

17. "Thou, O poiſon, art the child of BRAHMA', ſtedfaſt in juſtice and in truth: "clear me then from this heavy charge, and, if I have ſpoken truly, become nectar "to me."

18. Saying this, he ſhall ſwallow the poiſon *Sárnga,* from the tree, which grows on the mountain *Himálaya*; and, if he digeſt it without any inflammation, the prince ſhall pronounce him guiltleſs.

19. Or the prieſt ſhall perform rites to the image of ſome tremendous deity, and, having bathed the idol, ſhall make the accuſed to drink three handfuls of the water, that has dropped from it:

20. If, in fourteen days after, he ſuffer no dreadful calamity from the act of the deity or of the king, he muſt indubitably be acquitted.

XXIV.

THE SECOND ANNIVERSARY DISCOURSE, DELIVERED 24 FEBRUARY, 1785. *See the Works of Sir William Jones, Vol. I. p.* 9.

XXV.

THE THIRD ANNIVERSARY DISCOURSE, DELIVERED 2 FEBRUARY, 1786. *See the Works of Sir William Jones, Vol. I. p.* 19.

XXVI. COR-

XXVI.

CORRECTIONS OF THE LUNAR METHOD OF FINDING THE LONGITUDE.

By Mr. REUBEN BURROW.

THE intent of the following remarks is to point out an error in the uſual practice of making the lunar obſervations, and another in the method of computation.

It is well known that a little before and after the conjunction, the whole hemiſphere of the moon is viſible, and the enlightened creſcent ſeems to extend ſome diſtance beyond the duſky part. Now, having determined the longitude of a place from the eclipſes of Jupiter's ſatellites, I took ſeveral ſets of diſtances of the moon's limb from a ſtar, near the time of the conjunction, both from the bright and the duſky parts of the circumference, and having calculated the reſults, I found that thoſe taken from the duſky part were much nearer the truth than the others: the nature of the error evidently ſhewed, that the ſtar had really been at ſome diſtance from the limb, when it appeared to be in contact with it; and, as the error was a conſiderable part of a degree, I ſaw it would be of conſequence to diſcover the cauſe of it; which, however, was obvious enough from NEWTON's principles, and may be explained as follows.

Let AD be the diameter of the moon, and A the centre of a ſtar in contact with the moon's limb; now, as the enlightened part of the moon evidently appears to extend beyond the duſky part, let the concentric circle BC repreſent the moon's limb thus apparently magnified, and ſuppoſe the ſtar to be equally magnified; then with the centre A, and the diſtance DC deſcribe a circle, which conſequently will touch the moon's apparent circumference inwardly; now as this laſt is a conſequence of ſuppoſing the centre of the ſtar to touch the circumference of the moon, excluſive of the deception, it follows, that *the proper method of taking the diſtance, is to make the ſtar appear to touch the moon inwardly.*

But all the writers on this ſubject have particularly directed that the ſtar be made to touch *outwardly:* let B, therefore, be the point of contact, and *a* the centre; the error then is Aa, or the ſum of the apparent increaſe of the moon's radius and the apparent radius of the ſtar: this quantity, it is evident, will make a

conſiderable

conſiderable error in the reſult, and errors ariſing from this ſource are the more to be attended to, as they are not of a kind to be leſſened by increaſing the number of obſervations. The ſame reaſoning is applicable to the ſun and moon with very little alteration.

The diſtance of the moon from the ſun or a ſtar, at each three hours, is given in the Nautical Ephemeris, and the method of inferring the time, for any intermediate diſtance, is by ſimple proportion: this would be juſt if the moon's motion was uniform: but as that is not the caſe, the velocity ſhould be taken into the account, as well as the ſpace, in determining the time, taken by the moon to move any given diſtance; and the proper meaſure of the velocity is ſuch a quantity, as has the ſame ratio to the ſpace deſcribed, as three hours have to the time, that has been actually taken to move the given diſtance: to find this quantity correctly would require interpolation, but it will be ſufficient in practice to find the time firſt by the common method, and then to correct the interval for three hours to that time, by taking a proportional part of the ſecond difference of the moon's diſtance at the beginning of each three hours; ſuppoſing the firſt differences to anſwer to the middle of each interval.

The laſt correction, though not ſo conſiderable as the firſt, will often bring the reſult nearer to the truth by three, four, five, or ſix miles, and ſometimes more, which in geographical determinations is of conſequence; and, by paying attention to thoſe and ſome other cauſes of error, which ſhall be pointed out hereafter, the reſults in general will be much nearer to the truth than is uſually imagined. It is common to throw blame on the imperfections of the lunar tables, but it would be much more properly applied to bad inſtruments and bad obſervers.

APPENDIX

TO THE

FIRST VOLUME

OF

ASIATICK RESEARCHES.

A

METEOROLOGICAL JOURNAL,

Kept by Colonel T. D. PEARSE, *from* 1ſt *March*, 1785, *to* 28th *February*, 1786.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain. Inches.	March 1785. Miscellaneous.
	h. m.										
	22.49	☽ L. Q.									
3											(a)
6	7.15 A	29,963		77		thin	3	SSW	1		(b)
7	3. P	29,915		79		thin	5	SSW	3		(c)
	6.30 P					thick thund.	10	SSW	3		
8	7.30 A	30,00		76		ditto	9	SSW	2		(d)
	7. P					thick	10				
	8. P							NW			
9	7. A	30,032		75,5		thick thund.	8	NW	1		(e)
	1.55 P	29,97		79,5		none					
	16,27	☽ New									
10	4.50 P					thick thund.	9	NW	6		
	5.39 P					ditto	8	S	3		
	6.15 P	29,95		76,5		ditto	8	S	4	,142	(f)
11	7. A	30,00		70				S by W	1		
12	6.35 A	29,95		79				S	1		(g)
13	6. A	29,85		79		thin	2	S by E	1		(h)
	2. P					thick	4	S	3		
	4. P					thick thund.	8	S by E	3		
	5.2 P	29,77		80,5		ditto	9	S	5	,259	
	5.30 P										
14	7. A					thick	6	SSE	2		
	2.20 P	29,816		83		ditto	9	SSE	2		
15	6.45 A	29,854		79,5				S by E	1		(i)
	8.25 P					thick thund.	9	N	5		
16	7.40 A	29,873		78		ditto	10			,022	(k)
	2.20 P	29,813		82		thick looſe	8	SSW	4		
	12.52	☽ F. Q.									
17	7.15 A	29,887		80		thick	5	SE	1	,039	(l)
	2.30 P	29,828		84		ditto	4	SSE	2		
								Carried forward,	–	,462	

(a) Laſt Friday the fog was exceſſive, and did not begin to clear till 9. Saturday the ſame. Sunday it began to clear about 7.

(b) The fog is gone off to-day already: it was but ſlight.

(c) Much lightning in the NW. and diſtant thunder.

(d) Much lightning in the NW. A puff from the NW. but without rain or thunder.

(e) There was a very ſmall ſprinkling of rain juſt now.

(f) In the morning we had a thick fog, which formed into clouds, and went over to the N. and at 2 maſſes were formed there: from whence at 4.50 we had a ſtorm, which was over in half an hour; and at *Dumdum*, about 10 miles off, they had heavy hail.

(g) Fog ſo thick that an object at a 100 yards is inviſible.

(h) 6. A. Foggy. A ſtorm will come on in the evening. 4. P. Diſtant thunder. 5.2 P. We have had a furious ſtorm of hail, with thunder and lightning, and SW to SSE 6. 5.30 P. Loud thunder ſtill continues in the ENE. where the maſs now is.

(i) 6.45 A. Every thing hidden in fog, which will produce a ſtorm at night. 8.25 P. Much lightning, and the expected ſtorm coming on.

(k) 7.40 A. The thunder rolled all night: exceſſive lightning.

(l) 7.15 A. A ſtorm began to gather about 5 P. and we had much lightning about 10. Between 12 and 1 it began, and the wind very violent. The thunder cloſe, and ſo heavy, that it jarred the whole houſe like an earthquake. 2.30 P. It has been very gloomy at times all day.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kinds.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	March 1785. Miscellanous.
								Brought forward,		,462	
18	6. A	29,915		80		thin	3	S	1		
	2. P	29,85		86		looſe	3	S	4		
19	2.20 P	29,813		84				W by S	2		
20	1.30 P	29,833		85		thin	9	SSW	3		
21	6.15 A	29,813		81		thin	2	SW by S	2		
	2. P	29.80		86		thick & thin	5	S by W	4		
22	6.30 A	29,825		82		thick looſe	10	SW by S	3		(m)
	2. P	29,837		86		thick	3	SW by S	5		
23	2. P	29,784		85,5		thin	7	SW by S	3		(n)
	7.45					thick thund.	10	SSW	5	,084	
24	8. A	29,87		81,5		thick	7				(o)
	2. P	29,825		85		thick thund.	10	W by S	2		
	9. P									,001	
	h. m. 16.02	☽ Full									
25	6.15 A	29,859		82		thick	4	SSE	2		
	2. P	29.866		86		none		S	3		
26	5.45 A	29,915		82		thick looſe	10	S	1		(p)
	2.15 P	29,87		86,2				S	4		
27	7.15 A	29,865		82		thick	10				
	2.15 P	29,785		87				S	2		
28	6.45 A	29,795		81				S	1		(q)
	2.10 P	29,798		87,5				SSW	4		
29	6.45 A	29,862		81,5		thin	2	S½W	1		(r)
	2.15 P	29,830		87,0				SSW½W	3		
30	6.45 A	29,822		81,5		thin	5	S½E	1		(s)
	1.30 P	29,848		83,5		thick	10	NE	1		
31	7.15 A	29,862		79,0		ditto	10	NNE	1	,007	(t)
	2. P	29,797		83,0		ditto	9	NNW	1		
								TOTAL IN MARCH,		,554	

(m) Great appearance of approaching rain and ſtorms.

(n) 8. A. The morning was very cloudy, and the wind ſtrong; it preſaged a ſtorm; and I ſtill expect one before midnight. At ſun-ſet it threatened, and at 7 P. the lightning began to be vivid in the WNW. It rained for about ten minutes. The thunder was very near.

(o) 8. A. The wind began about 11. P. and raged till paſt 1 o'clock with uncommon violence. 2. P. Exceſſively gloomy. 9. P. At 7 we had a thunder guſt, which was ſoon over, with a ſprinkling only.

(p) 5.45 A. The clouds began to collect at 8 laſt night and are very thick. 2.15 P. The clouds continued very thick till paſt 10, and were not diſpelled till paſt 1.

(q) 6.45 A. Exceſſively thick fog. 2.10 P. The true along-ſhore wind, which diſorders the whole frame.

(r) 6.45 A. Foggy. Laſt night the clouds were thick 10 at 11 P.

(s) 6.45 A. Foggy. It has been extremely gloomy ever ſince 7 o'clock, and about noon we had a few drops of rain.

(t) 7.15 A. We had a ſmall ſhower of rain about ſun-riſe, and there has been more at a diſtance from the feel of air.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	April 1785. Miscellaneous.
1	6.45 A	29,866		79,5		thick thund.	10	WNW	2		
	2.10 P	29,816		82		thick	10	SE	1		(a)
	10.16	☽ L. Q.									
2	6.45 A	29,828		77				E½S	1		
	2. P	29,777		83,7		thick ſcat.	3	WNW	3		
3	6.45 A	29,765		79				S by W	1		
	2. P	29,711		85,5		none		WNW	2		
4	7. A	29,785		80				SE by S	1		
	2. P	29,750		86				WNW	1		
5	6. A	29,763		78		thick	2	SE	2		(b)
	1.45 P	29,760		86,7		thick gather.	3	S by E	2		
6	6.30 A	29,76		80,5		thick	5	E	3		(c)
	2. P	29,748		88		ditto	1	SW½S	4		
7	7. A	29,82		80							
	2. P	29,79		87,5				SSW	5		(d)
8	7. A	29,846		81,5		looſe	4	S by E	2		(e)
	2. P	29,761		87,5	94			SW½S	4		
	1.39	☽ New									
9	6.30				81	thick looſe	10	S	2		
	2. P	29,75		88,5	96,5			S by W	4		
10	7.45 A	29,76		84		thick	9	SSW	5		
	2. P	29,718		88	92,2			SSW	5		(f)
	5.30 P	29,708		87	88	thick	10	SSW	5		
11	6.40 A	29,788		85	81,5	thin	7	SSW	2		(g)
	2. P	29,766		89,5	96,0	ditto	8	SW by S	3		
	6.15 P	29,779		88	83,15	thick thund.	8	SSW	3		(h)
	8. P									,016	
12	7.15 A	29,740			83						
	2.30 P	29,765		90,5	100,5			NE	2		
13	6.30 A	29,783		82	81	thick & thin	10	SW by S	2		
	10. P	29,818		84	83,5	thick	10	N	1	,002	(i)
14	7. A	29,820		83	85	ditto	9	S by W	3		
	2.30 P	29,848		86	88	ditto	10	S	2		(k)
15	7. A	29,915	28	82	81	ditto	10	S½W	1		
	1.45 P	29,90	22,5	85	92	ditto	10	NE	1		(l)
								Carried forward,		,018	

(a) We had a ſprinkling rain to-day of half an hour's duration.

(b) Exceſſively thick haze.

(c) Laſt night the clouds were ſo heavy that they ſeemed to threaten a ſtorm.

(d) There were flying clouds from 8 till 11 to-day, but all are gone.

(e) Yeſterday evening there was a maſs over *Calcutta*, and much lightning and ſome thunder, and this morning we had a fog.

(f) There will be a ſtorm to-day. 5.30 P. Diſtant thunder. The bank is not yet formed.

(g) The wind was tempeſtuous the greateſt part of the night, but we had not any rain. It is now foggy, and threatens.

(h) Yeſterday there was every reaſon to expect a violent ſtorm, but it went off from us. To-day there was but little expectation, and it now rains ſmartly, and there has been a great deal of thunder; and all this without any change of wind.

(i) We had a ſmall ſhower at 1, and another juſt now. The wind was NE 2 all the afternoon.

(k) The wind changed ſuddenly juſt after laſt obſervation to the S again, and we had a very windy night. 2.30 P. It has been gloomy all day.

(l) A ſprinkling rain in very diſtant drops. The wind of the night was of ſuch a kind, that it prevented the poſſibility of ſleeping.

The morning rain, and a like ſprinkling ſince, could not be meaſured.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	
								Brought forward,		,018	
16	7. A	29,95	15	80	82,5	thick	10	N	4		(m)
	8.15 A	29,99	17,5	80	74	ditto	10	NE by E	3	,087	
	2.15 P	29,893	29	80	80	ditto	10	NE	4		
	3-44 P	☽ F. Q.									
17	7.15 A	29,864	32	70,5	86	thick	10	E by N	4	1,314	(n)
	2.15 P	29,79	43	78	75	ditto	10	S by E	3	,763	
	8.20 P	29,828	44	78	74	thick looſe	10	SE½E	3	,752	
18	6.15 A	29,80	46	79,5	76	thick	9	SSW½S	1	,284	(o)
	2.15 P	29,839	48,3	80,5	86	thick white ſc.	4	NW	1		
19	7. A	29,913	50	80		thick looſe	7				(p)
	2.15 P	29,813	43,5	83,5	90	thick white	7	SW½S	2		
20	5.40 A	29,8	43,5	79,5	76	thin	4	S by W	2		
	2.25 P	29,792	42	86	90	thick looſe	4	S	4		
	10. P	29,881	36,5	76,5	80,9	thick	10	NNE	3		(q)
21	6. A	29,812	40	76,9	73,5	ditto	3	SSE	3		
22	8. A	29,876	41	77	74	ditto	10	SW by S	3	,410	(r)
	2. P	29,785	36,5	82	89	ſcattered	2	SSW	3	,007	
23	5. A	29,750	50	79	77			SW	2		
	2.15 P	29,760	46	86	93			S by W	2		
24	7. A	29,748	54	82,5	84			S	2		
	2. P	29,722	45	87,5	94	ſcattered	2	S by W	3		
	8-8 P	☽ Full									
25	6.30 A	29,71	53,5	83	83			SSE	2		
	2. P	29,71	42	90,5	96,5	ſcattered	3	S½E	4		(s)
26	7.15 A	29,740	47	84	85	ditto	3	S	2		(t)
	2. P	29,735	39	89	94	thick	9	S by E	4		
27	7. A	29,705	47,5	84						,220	(v)
	2. P	29,697	43	87,5	91	thick	9	S by E	4		
	7. P	29,711	43	83	86	thick thund.	10	NNE to NNW	7	,170	
	8. P							WNW	9	,270	
	9.45 P										
28	6.45 A	29,713	40	81,5	78	none		SW by S	2	,013	(w)
	2. P	29,723	44	87,5	93			SW by S	2		
29	6. A	29,713	49	83,5	80,5	none		SW by S	2		(x)
	2. P	29,753	37	87,5	93			W by S	2		
30	7. A	29,79	50	83,5	84	none		SW by S	2		
	2. P	29,79	37,5	91	97,5	thick ſmall ſcat.	2	SSW	4		
								TOTAL IN APRIL,		4,308	

(m) It has been a blowing cold night; wind northerly, and it ſprinkles rain. 8.15 A. A heavy ſhower juſt over, and drizzling rain ſtill continues. 2.15 P. We have had more ſprinkling rain.

(n) About 6 yeſterday it began to rain in drops; before 9 it was ſmart rain. It has continued all night, and ſtill rains. 2.15 P. It has rained inceſſantly all day. It ſtill rains hard, and now the clouds begin to break a little. 8.20 P. It ſtill ſprinkles.

(o) It began to thunder at a great diſtance about 8, and by 12 it was near us; and this put an end to the rain before 3. A.

(p) The morning was foggy.

(q) A ſmall ſhower of rain, and the wind changed from the S. to NNE.

(r) At 12. P. a maſs formed in the NW. came on; and in a ſhort time we had a ſtorm without thunder. It ſprinkles to-day. 2. P. Produce of the ſprinkling.

(s) Very hazy and foul air.

(t) Lightning laſt night; and very foul air to-day.

(v) A regular northweſter laſt night at 8. P. 7. P. Sprinkling rain begun. 8. P. the produce of the ſtorm, which is abated: diſtant thunder. 9.45 P. A very ſevere ſtorm juſt over, which begun about 8.20. It ſtill thunders.

(w) This was, with produce of a ſmall ſhower, about 10.30 P.

(x) The night very hot, and the air loaded with damp: the morning cool and pleaſant.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	
1	7.40 A	29,813	47,5	84	86			SW	3		
	2.10 P	29,762	32,5	90	98,5			W	3		
	6.22 A	☽ L. Q.									
2	7.45 A	29,750	47,5	84	86	ſcattered	3	SW	4		
	2. P	29,710	38	89	98	ditto	1	SSW	3		
3	6. A	29,712	45	83,9	82			SSW	2		
	2. P	29,720	38	89	95	none		SSW	4		
4	6. A	29,735	39	83,3	82			S by W	2		
	2.20 P	29,780	36	88,5	93			SSW	4		
5	5.30 A	29,745	43	83,5	81,5	looſe	9	S by W	2		
	2. P	29,746	37	89	94	ditto	3	S by W	5		
6	5.30 A	29,808	37	82	79,5			S by W	2		(a)
	2. P	29,800	32	88	94,5	thin	2	S by W	5		
	8.45 P	29,997	28,5	82,5	78,5	thick thund.	10	NW by W	7		
	9. P	30,000	32,5	82	72	ditto	10	NW by W	3	,328	
7	5.30 A	29,840	31,5	81,5	76,5	thin	8	NNW	1		
8	6. A	29,897	40	81	81	thick	5	S by W	1		
	2.30 A	29,90	32,5	88	94	thick	3	SSW	4		
	10.25 P	☽ New									
9	5.30 A	29,875	44	81,5	80	thin	7	S	1		
	2. P	29,882	34	88	95,5	thick	6	SW by S	4		
10	7. A	29,867	41	82,7	84,6	thin	3	SW by S	3		
	2. P	29,843	32,5	88	95,5	thick	5	S by W	4		
11	7. A	29,810	40	83,3		thick & thin	10				
	2. P	29,783	31,5	89	97,5	thick ſcat.	2	SSW	4		
	7.30 P	29,744	35,5	87,5	86,7	thunder	4	SSW	3		(b)
	7.47 P	29,814		87		ditto	9	NW	5		
	7.55 P	29,814	31	87	82	thunder	9	NW	7		
	8.25 P	29,808	35	83	73	ditto	10	NW by W	2	,325	
	9. P	29,754	36	79,5	74	ditto	10	ENE	2		
12	5.40 A	29,718	41	82,5	81	thick	10	S by W	2		
	2.20 P	29,752	32	89	96			SSW	4		
13	7.30 A	29,753	42	85	85	thin	7	S	4		
	2.20 P	29,754	35,5	91,5	98,5	looſe	8	S by E	3		(c)
14	5. A	29,785	35	82	78	thick	3	N by W	1		(d)
15	5. A	29,797	39	81,9	81,3	thin		E by S	2		
	2. P	29,765	26	90,5	96		2	NE	3		
	7.10 P	29,752	24	88,7	88,3	thick thund.	9	W by S	3		(e)
16	6.15 A	29,777	34	83	82,2	thin	2	NE	1		
	8.54 A	☽ F. Q.									
	2. P	29,740	17,5	89	95,5	thick thund.	4	WNW	2		
								Carried forward,	–	,653	

(a) Much lightning laſt night, and a maſs in N and NW. from whence we had a blaſt of wind at 10. P. 8.45 P. Sprinkling rain begun. 9. P. Very heavy thunder; a ſmart ſhower juſt over.

(b) A heavy thunder maſs in NW. and much lightning, with diſtant thunder. 7.47 P. The wind juſt changed, and the maſs reached the zenith. 7.55 P. Small rain begun. 8.25 P. Heavy rain over, ſmall rain continues.

(c) A very oppreſſive heat to-day. The air does not carry off perſpiration, and makes the whole body clammy and comfortleſs.

(d) The heat produced thunder all the afternoon till near 10, with ſqualls of wind from every quarter in turn, but without rain.

(e) The wind ſhifted about a quarter of an hour ago.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	May 1785. Miscellaneous.
						Brought forward,				0,635	
17	6.15 A	29,810	32,5	80,5	80,7	thick	7	ENE	2		
	2.15 P	29,785	25	89,5	98,5			SW by W	4		(f)
18	7.30 A	29,868	37,5	82	84,5	loose	3	E by S	3	,057	(g)
	10.30 A	29,895	36	85,8	87,7	thunder	10	SSW	4		
	11.5 A	29,886	36	81,7	78	ditto	10	ENE	3	,558	
	2.20 P	29,813	38	85	90	thick & thin	4	SE	3		
19	7.10 A	29,850	37,0	80	78,5	ditto	5	NW by W	3	,003	(h)
	2.15 P	29,763	30	85,7	94,5	scat. hard	2	WSW	3		
22	7.5 A	29,713	36	83,5	85,3			NE	2		(i)
	2.10 P	29,677	28	90	95,5	thick	7	E	3		
23	7.30 A	29,655	38	84	87	thin	3	NE by E	2		(k)
	2.10 P	29,613	27,5	89,3	93	thick	6	NW	3		
24	7.55 A	29,563	37	88	92			SW by S	4		
	9.22 A	☽ Full							*		
	2. P	29,515	22	92,3	101,0	scattered	4	WNW	3		
	6.40 P	29,502	21	91,5	91,5	thunder	8	N	3		(l)
	6.55 P					ditto	8	SSE	5	,240	
25	7.40 A	29,563	21	81,7	80,7	thin & thick	10	S by W	3	,303	(m)
	2. P	29,573	37	90	96	ditto	10	SSW	4		
	8.50 P	29,592	33	80,5	74,8	thu. remains	10	S by E	3	,562	
26	7.50 A	29,640	37,5	81	80	thin uniform	10	E by S	3	,026	(n)
	2.40 P	29,616	35	86,5	93	thin	10	SSW	3		
27	7. A	29,650	45	84	84	thin	10	SSW	3		
28	7.30 P									,336	(o)
	11. P	29,765	40	82	76	thunder	10	W by N	4		
29	8.30 A	29,742	38	84	86,5	scattered	2	SSW	3	,082	
	2.23 P	29,696	39	88,3	92,5	thick	7	SSW	5		
	8.10 P	29,703	43,5	86	86	thunder	10	S	0		
	8.25 P	29,757	43,5	86	86	ditto	10	N by E	1		
30	6.40 A	29,710	47	84	83,5	thin & thick	5	SW by W	2	,173	
	10.40 P	29,663	44	86,5	85,5	thunder	10	SSW	3		(p)
31	7.40 A	29,641	46	86,3	80	ditto	10	ESE	2	,697	(q)
	11.57 A	☽ L.Q.									
	2.20 P	29,590	44	87	93	thick	7	SW	3		
						TOTAL IN MAY,	–			3,690	

(f) The clouds were 6 about 10, but are all gone.

(g) A small thunder shower at 7. P. yielded the water. It came from ENE. 10.30 A. A thunder shower just over of about ten minutes duration. 11.5 A. A very heavy thunder storm just over: it began immediately after last observation.

(h) We had another storm in the night, with a sprinkling of rain.

(i) We had a mass of thunder clouds from NNW last night, without rain. 2.10 P. The heat very oppressive.

(k) We were almost suffocated last night. I could not close my eyes till past 4.

(l) It rains, and there has been distant thunder. 6.55 P. Thunder close and loud; heavy rain.

(m) Between 11 and 12 the storm came on again heavier than before. 2. P. The air does not carry off perspiration, and therefore leaves the body clammy. 8.50 P. At 7 we had a most furious storm from N 8: a torrent of rain, but of short duration; and all has been quiet this hour.

(n) After last observation, it began to rain small rain, which continued some time.

(o) We had in town a very violent northwester, and it reached the gardens, where it produced this rain. 1.11 P. The day has been hot, and the sky covered with thin clouds; since 8 they have collected, and we had much lightning in the WNW. and now the storm has reached us.

(p) Much lightning in the NNE. and distant thunder.

(q) It sprinkled rain soon after last observation, but at 5. A. we had a tremendous thunder-storm.

A METEOROLOGICAL JOURNAL.

Day	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	April 1785. Miscellaneous.
1	7.10 A	29,570	47	84	86,5	thunder	5	SSW	3		(a)
	2.30 P	29,525	37	89	103,0			SSW	3		
	8.40 P	29,612	41	88,5	88	thunder	10	WNW	5		
	9.15 P	29,637	38	85,2	77	ditto	10	SW½W	4		
2	7. A	29,585	45	84	85	thick	8	S by E	3	,665	(b)
	2.20 P	29,590	42	84	88	ditto	10	S by E	3		
3	6.40 A	29,565	46	82	83	thin	3	SE	3		
4										,168	(c)
5										,154	(d)
6	8. A	29,592	48	84	87	thick	6	ESE	2		(e)
	7.38 A	☽ New.									
7	8.20 A	29,616	51	83	84,5	thunder	10	SSE	3	,100	(f)
8	8.20 A	29,621	52	83		thick	10	SE by S	4		
	2.20 P	29,580	48	83,5	88	ditto	10	S by E	3	,503	(g)
9	8.40 A	29,657	47,5	80	77	thick looſe thun.	10	SSW	3	,700	(h)
	1.50 P	29,625	50	81	79,5	ditto	10	SSE	4	,469	
10	8.15 A	29,655	55	83	87	thick ſcat. looſe	5	S by E	4		
	2.15 P	29,617	52,5	83,5	86	ditto	10	S by W	4	,036	(i)
11	7.30 A	29,655	57,5	83	88,5	ſcattered	4	S by E	3	,056	(k)
	2.20 P	29,633	48,5	88	95	ditto	6	S by E	4		
12	7.30 A	29,633	53,0	84	87,5	looſe	7	S by E	4		
	2.23 P	29,580	45,0	86	96	ditto	5	S	4		
13	5.35 A	29,593	54	83	82	thin	5	S	2		
14	5 25 A	29,500	50	83	81,5	ditto	5	S	2	,478	(l)
	2.28 A	☽ F.Q.									
15	7.25 A	29,420	51	83,5	82,5	thick & thin	9	NW	3	,006	(m)
	2.20 P	29,367	53	82,5	80,5	thick	10	NW	4	1,317	
16	7.40 A	29,472	52,5	80,5	78	thick looſe	10	WSW	3	1,700	(n)
	2.15 P	29,450	53	83	87	thick	10	SW by S	3	,188	
17	6.15 A	29,504	55	80	78	ditto	10	SW by S	3	,477	(o)
18	6.35 A									1,736	(p)
	8.15 A	29,630	55	79	75,8	thick looſe	10	S by E	3	,200	
	2.15 P	29,581	55	82,5	85	thick	10	S by E	3	,150	
								Carried forward,		10,104	

(a) There was a great deal of thunder laſt night. About 2 it was moſt oppreſſively ſultry, being a dead calm. 8.40 P. After exceſſive lightning in the NW. the maſs has reached us, and the ſtorm is begun. 9.15 P. It ſtill rains ſmartly: the thunder now approaches, but is very far off. This looks more like the rains than any thing we have yet had; and if the wind veer to the ſouth we may reaſonably expect them.

(b) Produce of laſt night's ſtorm. (c) Produce of a thunder-ſtorm at noon. (d) Do. and at noon alſo.

(e) There was a ſtorm at noon, and at dinner time, and the evening was fine.

(f) It has rained this morning with thunder; this water is yeſterday's and to day's.

(g) We had rain yeſterday, and twice to-day, and this is the produce of all.

(h) It began to blow and thunder and lighten at 12,30, and before 1. A. we had a heavy ſhower. Ever ſince it has rained more or leſs, with much thunder. 1.50 P. It has rained without ceaſing, more or leſs, ever ſince morning.

(i) We have had a thunder ſhower from SW. (k) There was a ſhower at day-break.

(l) At 6. P. yeſterday a heavy ſhower from NW gave this water: and there was only a ſprinkling in town.

(m) There was a ſmall ſhower about 3, and another about 9 P. 2.20 P. Heavy ſhowers began about 9, and ſtill continue with ſhort intervals.

(n) It has rained ever ſince laſt obſervation; at times only ſprinkling, at others ſmartly; and now moderately. 2.15 P. The rain abated gradually, and ceaſed before noon.

(o) At 9 P. a thunder ſtorm from the W. brought on rain again, and it continued till morning.

(p) It was running out through the air-hole. How long it had done ſo I cannot tell; but it rained all day yeſterday: drizzling and at times barely perceptible; heavily about 6 P. and drizzling till near day; then hard again; and now it rains ſmartly, as it did when the water was meaſured, and there is ſome in the meaſure beſides. 2.15 P. The rain ceaſed about 10, and the ſun ſhone at noon.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	June 1785. Miscellaneous.
						Brought forward,				10,104	
19	8. A	29,558	58	81,5	84,3	ſcattered	6	SSW	2	,375	(q)
	2.20 P	29,528	52	83	82,8	thick	10	W¼N	2	,156	
20	8. A	29,567	50	81,5	84,5	thin & thick	7	SSW	3	,004	(r)
	2.10 P	29,520	50	81,3	84,5	ditto	6	S½E	4	,332	
21	7.35 A	29,549	53	80	78,5	looſe low thick	10	S½W	2	,132	(s)
	2.15 P	29,522	48	83	89,7	ſcattered	5	SW by S	4	,001	
22	7.25 A	29,552	53	81,5	81,5	thick	10	W	2	,007	(t)
	8-11 A	D Full									
	2.25 P	29,525	51,5	83	90,5	thick ſcat.	7	S by W	2		
23	8.50 A	29,539	55	82	79,5	looſe	10	NW	1	3,250	(v)
	2.20 P	29,521	56,5	82	82,8	looſe	10	S	3	,076	
	6.20 P	29,498	56			thick	10	S by E			
	6.55 P	29,516	56	83		thick looſe low	10	S by E			
24	6.20 A	29,510	58,5	81,5	81,5	thin	10	SE	3	1,778	(w)
	11.45 P	29,524	58	82	81	thick ſcat.	8	SE	3	,068	
25	7.20 A	29,512	59	83	84,5	thick	8	ESE	4		
	2.40 P	29,472	53	83	92,5	thick ſcat.	5	SSW	2		
26	7.35 A	29,508	56,5	83,5	83,5	thick	7	WNW	2	,073	(x)
	2. P	29,482	52,5	84	87	thick	9	SW	2		
	6.20 P	29,471	56	83	83,5	thick	5	SW by S	3	,507	
27	7.15 A	29,490	59,5	84	84,5	thick low	10	SSW½W	3		(y)
28	9. A	29,472	57	81,5	79,5	thick low looſe	10	SE	3	1,000	(z)
	2.15 P	29,428	58,5	83,5	87,5	thick low	10	SW by W	3	,367	
29	7.20 A	29,446	56,5	83	86	thick looſe gat.		S by W			(aa)
	2.25 P	29,406	51,5	85	91	thick	6	S by W½W	3		
	4-21 P	D L. Q.					9		3		
30	7. A	29,224	50,5	83	82	thick	8	S½W	3	,169	(bb)
										,213	
										18,611	
										7,450	(cc)
						TOTAL IN JUNE,				26,061	

(q) Between 10 and 11 P. there was a heavy ſhower, that produced 2 of this quantity; the reſt fell this morning. 2.20 P. A ſhower juſt over.

(r) This was the end of the laſt ſhower. 2.10 P. A heavy ſhower about 11 o'clock in the forenoon.

(s) Miſty rain. 2.15 P. It cleared ſoon after laſt obſervation.

(t) A ſhower about 4 o'clock this morning.

(v) About 1 it began to rain in torrents. At ½ paſt three 2 inches were meaſured. At 6½ this morning a third; the reſt fell ſince, and it ſtill ſprinkles. There was exceſſively heavy thunder, with moſt vivid lightning, at 3, though but little wind. 2.20 P. Drizzling rain all day. 6.55 P. A ſprinkling about 6.35. Diſtant thunder.

(w) Soon after laſt obſervation it began to drizzle, and the mercury roſe, but in a ſhort time after fell again. The rain continued till 1 in the morning, and for about two hours was very heavy. 11.45 P. This fell in the courſe of the day, about 9 and again 2. P.

(x) A ſmall ſhower at 7. P. yeſterday, and another juſt over. 2. P. A ſhower in the forenoon. 6.20 P. A ſhower about 5. P. and the above produced this water.

(y) The night was clear, and ſtars bright.

(z) It was very gloomy at 9, with much lightning. About midnight it began to rain; towards morning more, and at 6. A. heavily, and ever ſince ſmartly, and ſo it ſtill rains. 2.15 P. It rained till near noon, and is about to rain more.

(aa) The morning has been bright.

(bb) The rain fell about 8. P. laſt night in a ſmart ſhower from SW wind 5. ,213 This rain fell about 6 P. and was heavy for the time it laſted.

(cc) Add this for the overflowing on the 10, 18, 23 and 24, when the garden was all under water.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	July 1785. Miscellaneous.
1	2.50 P	29,436	53	85	92	thick	4	E½N	3		
2	7. A	29,483	55,5	83	85	thick	6	E½N	4	,148	(a)
	0.10 P	29,510	47,5	83	84	thick looſe low	10	ESE	5		
3	9.20 A	29,512	55,5	83	84	thick looſe	6	E½N	6	,300	(b)
	2.20 P	29,480	55,5	83,3	85	ditto	7	S by E	4	,450	
4	8.12 P	29,556	54,5	82	84	thick	10	SW	4	,069	(c)
5	9.30 A	29,586	56,5	83	81,5	thick looſe	10	WNW	3	,900	(d)
	2.30 P	29,528	56	82	83	thick hard	10	SW by S	2	,017	
6	6.22 A	☽ New									
	7.10	29,486	57	81	78,5	thick looſe	10	NW	2	,923	(e)
	2.45 P	29,415	58	82	80,5	looſe	10	SW by S	3	,150	
	7. P					ditto	10	SW	7	,500	
7	6.40 A	29,40	58	81	78,7	ditto	9	SW½S	3	,359	(f)
9										,300	(g)
										,186	
	8. A	29,60	61	82	84	thin	6	SE	2		
10	7. A	29,654	62	82	83,5	thick thun. col.	5	S	4		
	0.15 P				94	ditto	7	S	4		
	2. P	29,610	62	83,5	88,7	thick thund.	8	SSE	4		(h)
11	7.30 A	29,662	59	83	88	thick ſcat.	8	S½E	2		(i)
12	2.30 P	29,556	56	83,5	90,7	thick	10	SW by S	3	,036	(k)
13	7.30 A	29,516	58	83	82	looſe	10	SW by S	2	1,500	(l)
	2.30 P	29,460	58	83	86	thick	10	SSW	3	1,223	
14	6.40 A	29,944	55	81,3	80,7	thick	10	S by W	3	,016	(m)
	7.28 A	☽ F.Q.									
								Carried forward,		7,077	

(a) The night very cloſe and ſuffocating. After 3 in the morning, thunder and lightning, and a little wind with rain made it poſſible to ſleep. 0.10 P. A heavy ſtorm came on, the wind was NE the greateſt part of the forenoon, now has changed.

(b) It rained all the afternoon, and till near 8. P, and is about to rain again. 2.20 P. Flying ſhowers, five or ſix ſince laſt obſervation.

(c) The produce of ſeveral drizzling flying ſhowers after laſt obſervation.

(d) About 6 it began to rain, and there were ,400 at nine. It has rained almoſt all night, and there were ,500 drawn off juſt now; it ſtill drizzles. The lightning fell cloſe to the bazar, that is about ⅓ of a mile from the houſe, but did not hurt any body.

(e) Rain in the night with lightning. Heavy rain about day-break, and the ſhower but juſt over. 2.45 P. Showers all the forenoon, and now ſet in. 7. P. It has been a very rainy, windy afternoon, and it ſtill continues ſo.

(f) It has been tempeſtuous at times, and rained in flying ſhowers all night.

(g) The 7th in the evening. ,186 The 8. to 2. P. when it ceaſed.

(h) It has thundered at a diſtance.

(i) There was lightning about 10. P. but not any rain.

(k) This rain fell yeſterday about 4. P. It has not rained ſince.

(l) It rained heavily laſt night about 11, and it has juſt begun again gently. 2.30 P. The rain continued till paſt one.

(m) The rain fell in the evening about 6.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kinds.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	July 1785. Miscellaneous.
								Brought forward,		7,077	
15	8.40 P	29.660	58,5	83	87	thick	9	SW	4	,072	(n)
16	2.40 P	29,586	54	85	91	thick	10	SW by W	3		
17	0.45 P	29,553	55	85	92	thick	7	SW by W	3	,184	(o)
18	2.20 P	29,442	54	83,3	85	thick	10	WSW	5	,340	(p)
19	7.20 A	29,468	57	81	78	thick looſe	10	SW by W	3	,291	(q)
21	10.20 P	29,596	60	83	82,5	thin	5	S½E	3	,430	(r)
22	5-20 A	☽ Full									
	6.15 A	29,586	64	82	81	thick looſe fog.	9	S	2		
24	7. A	29,682	61	80,9	81	thick	9	E by N	4	,110	(s)
	2.20 P	29,650	55	84	90	thick	3	ENE	2	,014	
25	5.45 A	29,675	58,5	81	80	thick	3	SSE	2		
26	8.50 A	29,686	54	84	87,5	thick & thin	8	SSW	2		
	2.30 P	29,627	51	85,6	91,5	thick	9	SE by S	3		(t)
	8.25 P	29,636	54	84	80	thick	8	NW by N	2	1,700	
27	7.20 A	29,641	56,5	83	87	thick	5	S	1	0,007	(v)
	2.20 P	29,613	52,5	84	89,5	thunder	10	SE	4	,025	
28	6.30 A	29,612	58,5	82	84,5	looſe	3	S by E	2		
	9-11 A	☽ L.Q.									
29	1.20 P	29,562	52,5	86	91.5	thick	8	ENE	3		
30	8.10 A	29,580	56,5	83,9	87	thick	9	SSE	2		
	2.40 P	29,512	51,5	86,5	93	thick	8	S by W	3		
31	7.15 A	29,528	56	82,3	80,7	thick	9	NE½E	3		
	2. P	29,370	58,5	80	79	thick	10	S	4	,226	(w)
										,016	(x)
										10,392	
								Overflowing,		1,700	(y)
										12,092	
								TOTAL IN JULY,		12,192	

(n) This rain fell the 14th in the night, and not any ſince.

(o) Rain yeſterday evening, and in the night before 3 o'clock.

(p) A very tempeſtuous night, and rain to day alſo.

(q) Sprinkling rain.

(r) ,4 fell on the 19th, the reſt yeſterday. Not any to-day. The forenoon was foggy and cloudy, very cloſe and hot.

(s) This fell the day before yeſterday. 2.20 P. A thunder ſhower at 11. Exceſſively high tide to-day.

(t) A ſhower juſt come on. 8.25 P. Two very heavy ſhowers ſince 7. P. about which time it began with very heavy thunder from SE, and varied to NW.

(v) The remainder of laſt night's ſtorm, which was over when the laſt obſervation was entered. 2.20 P. A thunder ſhower about 12, and it now thunders, and more is coming on.

(w) It rains hard. The wind has veered all round the compaſs at leaſt twice ſince morning, with flying ſhower of ſmall rain and diſtant thunder, of deep and heavy ſound.

(x) The wind increaſed to 8, and blew ſo for above an hour with rain, of which this is the produce.

(y) Add this for overflowing on the 26th, and it could not be leſs.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	August 1785. Miscellaneous.
1	6. A	29,490	60	81	79,3	thick	3	S by E	3		
2	6.10 A	29,515	62	81,7	81,3	thin & thick	4	SSW	2	0,005	(a)
	2. P	29,515	57	83,2	88,7	thick thund.	9	SE by S	3		
3	5.40 A	29,561	65	81,5	81,5	thin	2	S by E	2	,715	(b)
	11. A										
4	8. P.	29,544	57	83	83	thick	5	SE by E	2		(c)
5	7-26 A	☽ New									
	11. P	29,578	60	82,2	80,9	thin	6	SE	2	,719	(d)
6	6.30 A	29,528	64,5	80,9	80,9	thick	9	E by N	2		
	11. P	29,588	62	82,3	80,3	thin	5	SW by S	2	,271	(e)
7	8.30 A	29,580	63	82,3	83	thick	10	W by N	2		
	2.15 P	29,520	61,5	83,7	90,2	thick	9	SSE½E	3	,066	(f)
	11. P	29,600	64	83,5	81	thick	10	S by W	2	1,000	
8	6. A	29,592	62	80,5	78,5	thick	10	S½W	2	,546	(g)
9	7.50 A	29,750	63,5	89	79	thick	10	SW	2		(h)
	0.50 P	29,735	64	80	86	thick hard	8	S	2	,293	
10	6.20 A	29,700	64,5	80,5	81	thick	3	S by E	2		
	1.15 P	29,66	58,5	84,3	90,3	thick thund.	6	SSW	3		
11	9. A	29,638	67,5	83	86,3	thick	5	SSW	3		
	2.15 P	29,574	61,5	86	92,5	thunder	7	S by W	3		
12	7.50 A	29,608	66,5	83,6	87,3	thick	8	S½E	2		
	2.15 P	29,564	56	86,5	91,5	thunder	10	S½W	2	,070	(i)
13	7. A	29,606	65	81,5	82,2	thick	9	WNW	3	,014	(k)
	11-24 A	☽ F. Q.									
	2.15 P	29,550	63,5	82,8	86,5	thick thund.	10	S by E	2	,400	
14	7.45 A	29,544	64	81,5	82	thick	10	NW	2	,196	(l)
	2.20 P	29,466	67	84,5	89,5	thick	8	E½N	1		
15	7.45 A	29,498	65	82,7	84	thick	6	SSE	3		
	2. P	29,468	61,5	83,5	86	thick thund.	10	E by N	2	,143	(m)
16	7.45 A	29,528	65	82,8	83,2	thick	5	NE½E	3		
	2.15 P	29,460	57,5	85	87,3	thunder	10	NNE	4		(n)
17	7. A	29,472	64	81	80,2	thick looſe	10	NE	2	,475	(o)
	2.10 P	29,493	61,5	84,5	88,2	thick	8	SW by S	5	,025	
18	6.15 A	29,580	63	80,5	78,5	looſe	10	S	3	,583	(p)
								Carried forward.		5,521	

(a) About one P. it rained very heavily in town; and very little here: the quantity is noted. 2. P. Diſtant thunder.

(b) This fell in a very ſhort time. In town there was only a ſprinkling.

(c) It was very gloomy in town all the forenoon; and we had two ſmall ſhowers, but not any at the gardens.

(d) Of the water 5 fell laſt night, the reſt in the forenoon to-day.

(e) It rained almoſt the whole day ſmall rain.

(f) Rain in the forenoon. 11. P. And ſtill raining hard.

(g) It has rained almoſt inceſſantly all night long; and ſtill rains, though it is going off.

(h) It rains very heavily. The mercury is in a falling ſtate, ſo that it has been higher.

(i) This fell in the night about 15. P. and we have had a ſprinkling about 11 this forenoon beſides.

(k) This fell about 2 in the morning, with a guſt of of wind and ſome lightning. 2.15 P. Two or three thunder ſhowers ſince 9, and it now thunders.

(l) Yeſterday afternoon and in the night it rained.

(m) 2. P. Several ſmall ſhowers with thunder.

(n) 2.15 P. Thunder at a diſtance.

(o) Thunder ſhowers yeſterday afternoon, and in the night, and rain this morning. 2.10 P. Showers all the forenoon of very ſmall rain, and ſhort duration.

(p) It has been a very tempeſtuous night, with frequent ſhowers. It ſtill rains, and the wind was in general 6 and 7 in the night.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	August 1785. Miscellaneous.
						Brought forward,				5,521	
19	6.50 A	29,578	67	83	84	scattered	5	SSW	4	,142	(q)
	2.30 P	29,564	49	88	90,5	thick	5	SW by W	2		
20	7. A	29,580	63	83	85	thin	9	SW by S	3		
	1.41 P	☽ Full									
	2.20 P	29,566	40	90	93	thick	4	SW by W	4		
21	6.10 A	29,576	54	83	80	thick	5	N	1		
	1. P	29,625	52,5	85	85	thunder	10	NE by E	3		(r)
	2.15 P	29,578	54	84	83	ditto	10	ESE	2	,015	
22	6. A	29,588	58	83	81	thick	9	W by N	1		
	2.15 P	29,556	54	85	90	thick	8	NE by N	4	,052	(s)
23	6.30 A	29,570	61	83	81	thick thund.	9	N	1	,248	(t)
	2.15 P	29,576	59	83,5	86,8	thick	8	S½E	5	,053	
24	7. A	29,596	60	82	82	thick	7	E by S	3	,030	
	2.15 P	29,598	59,5	84	86	thunder	9	S by E	3	,084	(v)
25	6.30 A	29,646	62	82,5	81,5	thick & thin	9	S by E	2		
	2.15 P	29,640	55	85	86,5	thick	9	SSW	2		
26	7. A	29,690	61	82,8	83	thin	9	ESE	2		
	2.15 P	29,642	58	84	81,9	thunder	9	S½E	2	,186	
27	4.03 A	☽ L.Q.									
	6.15 A	29,700	61	82,5	80	thin & thick	7	SSE	3	,017	(w)
	2.25 P	29,688	57,5	84,5	88,9	thick	9	S by E	3	,004	
28	7. A	29,758	61	82,0	80,9	loose	10	SE by E	2	,200	(x)
29	7. A	29,696	61	81,8	81,8	thick	6	S by E	2	,214	(y)
30	7.10 A	29,704	63	83	83,2	thin	10	SW by S	2	,055	(z)
	2.35 P	29,628	58	85,4	88,5	thunder	9	S by W	2		
31	5.30 A	29,610	61	82	80,7	thick loose	10	WNW	1		
	2.25 P	29,600	63	82,5	81	thunder loose	10	WSW	2	1,707	(aa)
								Overflow.		1,700	(bb)
	7. P									,338	(cc)
						TOTAL IN AUGUST,				10,661	

(q) Rain about noon yesterday, and after it; and the conclusion of the shower yesterday morning.
(r) 1. P. Thunder at a distance; sprinkling rain began. 2.15 P. Thunder over.
(s) 2.15 P. Rain about 8 A.
(t) Thunder showers since last observation. 2.15 P. Several showers of short duration since last observation. Tides high.
(v) 2.15 P. Several small showers with thunder.
(w) Rain with thunder yesterday afternoon. 2.25 P. A small shower just over.
(x) Rain now falling, and some fell in the afternoon yesterday.
(y) Rain yesterday before sun-set.
(z) Rain in the night. 2.35 P. It has thundered this forenoon; and being then dead calm, the heat was almost insupportable. 2.25 P. The gage cistern holds only that quantity; how much fell I know not, but I think as much more.
(aa) The water measured to-day fell in about an hour. To-day I measured the cistern, and it holds only 1,707; and through the air-hole there runs out one-tenth in 40". It is impossible, therefore, to ascertain what did fall to-day; but that it had run out was evident; and from circumstances I judge the quantity was as much as was measured.
(bb) Add 1,700, it could not be less, as there was a great deal of water in the garden: and besides, I know from a canal that its water rose 3,4. Yesterday it was 1,5 below the drain; this afternoon the water ran through the drain two inches deep, and yet only three-tenths of rain fell in the afternoon.
(cc) This fell in the afternoon.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Sept. 1785. Miſcellaneous.
1	5.30 A	29,60	68	81,5	80	thick	5	S by W	2		
2	7.40 A	29,70	66,5	82	82,5	thick	5	S	3	,052	(a)
	2.30 P	29,67	68	83,5	85	thick	10	SSE	3	,156	
3	5.30 A	29,712	71	81,5	79,9	thick	3	SSE	1		
	2.20 P	29,700	65	83	86	thick	6	S by W½W	3		
	10.51 P	☽ New									
4	6. A	29,748	69	82	79,9	thin	5	S by W	1		
	2.20 P	29,730	50,5	85	92	thick	6	S by W	2		
6	6.15 A	29,772	55,5	83,5	82	thick ſcatter.	6	SSW	2		
	2.25 P	29,734	46,5	88	91	thunder	7	SW by W	4		(b)
7	5.40 A	29,720	55	84	82,2	thin & thick	6	SSW	3		
	2.30 P	29,714	45	87,5	89	thunder	9	SSW	3		(c)
8	5.40 A	29,716	55	84	81	thin	3	S by W	2		(d)
9	5.40 A	29,740	55	83	82	thin	3	S½W	1		
	2.10 P	29,730	45	87,5	92	thunder	5	SW by W	2		(e)
10	7.30 A	29,820	54	84,8	85	thin & thick	6	S by E	2		(f)
	2.25 P	29,784	48	88	92	thunder	9	SSW	3		
11	7. A	29,782	55,5	83	81,5	thick	9	N by E½N	2		
	2. P	29,754	50,5	86	88,5	thunder	10	SW by S	3		(g)
12	1.55 A	☽ F. Q.									
	6.10 A	29,720	55	83,5	80,2	thunder	6	SW½S	2	,582	(h)
	2.10 P	29,668	53,5	86	92	thick	9	S	2	,185	
13	5.55 A	29,650	57	84	82	thick	7	S by W	2		(i)
	1.20 P	29,592	55	87	93	thick heavy	9	SSE	2		
14	7.10 A	29,655	56,5	83,3	81,9	foggy	10	ESE	2	,010	(k)
	2.10 P	29,608	52	86	89,5	thunder	8	SE by S	4	,002	
15	5.50 A	29,600	56,5	82	80	looſe	7	E by N	3	,001	(l)
16	7.15 A	29,648	56,5	82	81	thin	4	E by S½S	3	,128	(m)
	2. P	29,616	54	84	86	thunder	5	E½S	2	,590	
	8.40 P	29,659		83	82	thin	5	SE by E	3	,110	
17	6. A	29,630	59	82	80	thin	9	SE by E	2	,003	(n)
	2.25 P	29,628	54	85	82,5	thick	10	E by N½N	1	,001	
								Carried forward,		1,820	

(a) A ſhower about 1 in the morning, with violent wind. 2.30 P. A ſhower about 10.

(b) Diſtant thunder.

(c) 2.30 P. We had a ſprinkling of rain at 11, and ſome thunder ſince.

(d) Yeſterday it rained hard at *Dumdum*, and to-day there was a very ſmart ſhower in *Calcutta*; only a ſprinkling here.

(e) 2.10 P. Diſtant thunder, but approaching from the SW to SSE.

(f) About and until ſun-ſet we had a double rainbow, but the rain was only in ſcattered drops.

(g) 2. P. Loud thunder in the NE.

(h) At ½ paſt 4 we had heavy rain from the SW. with lightning. 2.10 P. Rain about 9 o'clock.

(i) A ſprinkling juſt over.

(k) We had a great deal of thunder laſt night, ſprinkling rain and dead calm till day-break. 2.10 P. We had two or three ſprinklings, and ſome thunder.

(l) A ſprinkling in the afternoon about 3. P.

(m) This water fell yeſterday, and it did not rain in town. 2. P. At ½ paſt 12 a very heavy ſhower gave this water in leſs than 20 from SE 5. 8.40 P. This water fell about ſun-ſet, from which time the ſky began to clear.

(n) This fell in the night. 2.25 P. A ſprinkling in the forenoon.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Sept. 1785. Miſcellaneous.
								Brought forward,		1,820	
18	6. A	29,648	58	81	80,5	looſe	8	E by N½N	2		
	7. A	29,664	58	81	80	looſe	10	ditto	2		(o)
	2.20 P	29,613	56	84	85	looſe	10	S by E	3	,056	
	9.57 P	☽ Full									
19	6. A	29,590	59	81	80	thick looſe	10	E by S	2	,003	(p)
	2.15 P	29,588	61	83	87,2	thick heavy	10	S by W	2	,002	
20	6. A	29,580	62	81	80	thick looſe	10	SE	2	,281	(q)
	2. P	29,576	59	84,5	89	thick	8	S by E	3	,163	
21	7.50 A	29,687	61	81	81,5	thick	9	E by S	4	,387	(r)
	2.25 P	29,666	60,5	84,3	87	thick	10	SE by S	4	,084	
22	6. A	29,754	62	81	79,8	thick	3	E by N	4	,016	(s)
23	7. A	29,756	62	80	80,8	thin	4	NE	1	,270	
	1.30 P	29,728	58	84,7	88,8	thick	6	NW	1		(t)
24	8.15 A	29,723	62	83	84,5	thick	9	NW	3		
	2.15 P	29,636	55	86	89,5	thick	8	NNW	3		
25	8.50 A	29,668	58	83	84	thick	5	E by S	4		(u)
	2.15 P	29,583	53	84,3	86	thick	7	ESE	4	,154	
	2.21 P	☽ L.Q.									
26	8. A	29,666	58	80,8	81,2	thick looſe	5	ENE	3	,395	(w)
	2. P	29,608	58	82	84	thick	9	SSE varying to S by W	5	,291	
27	7.45 A	29,641	61	81	81,8	thin	5	SE	3	,018	(x)
	2.25 P	29,573	59	82	81	thick	10	SW	3	,130	
28	7.20 A	29,600	60	81	81	thick	9	SE by S	5	,130	(y)
	2.15 P	29,556	62	83	85,5	thick	10	SSE	5	,009	
29	6.30 A	29,638	63	81	79,5	thick	10	S by E	2	2,640	(z)
30	6.30 A	29,680	61	78,2	79,9	thick hard	4	SW½W	3	,182	(aa)
	12. P									,001	
								TOTAL IN SEPTEMBER,		7,032	

(o) 7. A. A ſmall rain. 2.20 P. Rain in the forenoon, ſeveral ſmall ſhowers.

(p) This fell yeſterday before ſun-ſet. 2.15 P. Rain in a ſhort ſprinkling this forenoon.

(q) Rain yeſterday evening, and in the night: it ſtill rains ſcattered large drops. 2. P. Rain in the forenoon.

(r) Rain with thunder at 5. P. again in the night twice, and ſince day alſo. 2.25. P. Two or three ſhowers ſince laſt obſervation.

(s) Rain in the afternoon yeſterday. Rain twice to-day.

(t) 1.30 P. The wind has varied round and round, though hardly perceptible.

(u) The night was dead calm till about an hour before dawn, and then we had a ſtorm from the NE. with lightning. 2.15 P. A ſhower juſt over.

(w) Rain at 4. A. and again at ſun-riſe. 2. P. Flying ſhowers all the forenoon.

(x) Rain yeſterday afternoon. 2.25. P. Several ſmart ſhowers ſince laſt obſervation.

(y) A very ſtormy night, with frequent ſhowers. 2.15 P. Two or three ſhowers ſince morning, but all momentary, and ſmall.

(z) Before 11 o'clock P. we had rain 15. Between 12 and 1 there came on a violent rain, attended with thunder, lightning, and wind, which varied round and round; it produced 1,25; before three 1,20, and the reſt ſince. It ſtill lowers, and threatens.

(aa) Several ſhowers yeſterday, and one in the night. 12. P. A ſprinkling to-day.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	OR. 1785. Miscellaneous.
1	8. A	29,826	58,5	81,2	81,5	thin	4	WNW	2		
	2.10 P	29,770	50	84	87,5	thin	2	W by S	3		
2	7.45 A	29,840	56,5	80,5	80,5			SW½S	2		
	2.20 P	29,797	37	83	86			WNW	3		
3	6.15 A	29,790	53	80,5	82	thin	7	SW by S	2		
	3.54 P	☽ New									
	5.30 P	29,764	46	84	84,5	thunder	5	WNW	3		(a)
4	7.15 A	29,845	54	81	80	thick scat.	4	NW	2		
	2.20 P	29,824	49	84,3	87,3	thick	6	WNW	2		(b)
5	7.30 A	29,875	54	82	81,5	thin	2	SE by S			
	2.15 P	29,833	43	86	90,5	thick	6	SSW	2		
6	6.50 A	29,910	52	82	79	thin	1	S	1		
7	6. A				78,5						
	7.40 A	29,872	51	82	81,5			SW			
	2.30 P	29,790	45	86	89,5	thick	6	WNW	2		
8	7.15 A	29,858	50	81	78	thunder	8	E½N	1	,331	(c)
	2.30 P	29,773	45	85	88,5	thick thund.	8	NE	2		
9	6. A	29,86	52	80,5	78	thick	3	NE	2	,335	(d)
	2.25 P	29,799	50	81,7	87,5	thunder	9	S by E	3	,268	
	10.30 P									,455	
10	5.35 A	29,873	55	78,2	75,5	thick	4	ENE	2	,002	(e)
11	6.15 A	29,907	56	80,5	78,6	thick scat.	7	E	2		
	2.20 P	29,863	52	84	88,5	thick	6	NNE	3		
	2.46 P	☽ First									
12	7.15 A	29,902	55	81,2	81	thin	2	W½N	1		(f)
	2.25 P	29,868	47	84,3	87,5	thick	6	NW	1		
13	6.30 A	29,900	53	81,5	79	thin	2	NW½W	2		
14	7. A	29,894	53	81,5	80			W by S	2		
	2.20 P	29,848	46	84	88,9	thick	8	WNW	2		
15	7. A	29,892	53	82	79,9	thunder	3	NW by W	2		(g)
	2.15 P	29,878	45	86	89	thick thund.	6	NW½N	3		
16	6.45 A	29,848	52	81,5	80	thin	4	N	2		
	2.25 P	29,897	46	86	88,5	thick	6	N	3		
								Carried forward,		1,391	

(a) 5.30 P. Rain in the North.
(b) 2.20 P. Very ſultry.
(c) There was much lightning in the North, with diſtant thunder, and at 4 we had a thunder ſhower.
(d) A thunder ſhower about ſun-ſet. 2.25 P. Rain began at 3, and continued till near 9; it came from the NE. with a very ſudden change.
(e) Whether this was rain or dew I do not know.
(f) At 6.30 A. The thermometer out of doors 78,7.
(g) Thunder at a diſtance twice this morning.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Forc.	Rain.	Oct. 1785. Miscellaneous
								Brought forward,		1,391	
17	6.20 A	29,928	50	80,7	78,2			N by E½E	2		
	2.5 P	29,885	42,5	85	86,5			N	4		(b)
18	6.46 A	☽ Full									
	6.50 A	29,914		79				N	1		(i)
	2.30 P	29,878		86				N	3		
19	6.30 A	29,872		79				NNE	2		
	2.30 P	29,856		86				N	1		
20	7.30 A	29,900		80		thick	10	N	2		(k)
	2. P	29,832		86		thin	5	N	2		
21	8. A	29,92		81,7		thin	3	N Eaſtly	3		
	2.30 P	29,864		87,5		thick & ſcat.	5	N	4		
22	6.20 A	29,884		78				N	3		
	2.40 P	29,828		87				NNE	4		
23	6.20 A	29,892		77,5		thin	4	N	3		
	2. P	29,864		87		thin	3	NE	3		
24	7.10 A	29,936		79,5		thin	6	NNE	2		
	2. P	29,903		85,5		thin	4	NNE	2		
25	4.45 A	☽ L.Q.									
	6.30	29,913		78,5		thin	4	NE	9		
	2.10 P	29,900		88		thick ſcat.	3	N	2		
26	6.40 A	29,874		80,5		thick & thin	4	NE	2		(l)
	1. P	29,860		88		thunder	8	SE	1		
	1.25 P	29,866		86		thunder	9	SE	4		
	1.40 P					thunder	10	SE	6		
27	7. A	29,840		78,5		thick looſe	10	NNE	1	,920	(m)
	2. P	29,780		83		thick	10	NE	2	,456	
28	7. A	29,724		77		looſe foggy	9	NNE	3		
30										,084	(n)
31										,012	(o)
								TOTAL IN OCTOBER,		2,863	

(b) 2.5 P. Quitted the gardens this evening.

(i) Firſt obſervation in *Calcutta*.

(k) The clouds began to collect yeſterday about 9 A.

(l) Foggy. 1 P. Diſtant thunder. 1.25 P. Do. and rain coming on. 1.40 P. Rain began in large drops.

(m) The rain fell heavily, and continued till about three, and produced the water above at the gardens. It has rained in the night, and I heard it at day-break, and it drizzles now 2 P. Smart rain. This water was meaſured in the morning.

(n) Rain at day-break.

(o) Rain at noon.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Nov. 1785. Miscellaneous.
2	7.15 A	29,947		80		thick	4	N	1		
	9.33 A	☽ New									
	2.30 P	29,912		85,5		thick	8	ESE	3		
3	8.30 A	29,964		80				N	2	,003	(a)
4	8.15 A	29,936		79,3		thick	6	NE	3		
	2.30 P	29,840		81,7		thick	8	E	3		
5	9. A	29,924		78,3		thick	10	N	3	,001	(b)
	2.20 P	29,802		82,3		thick	9	N	2		
6	6.40 A	29,850		78		thick	8	E	1	,019	(c)
	2.20 P	29,820		81,8		thick	10	NE	1		
7	7.40 A	29,914		78,3		ſtudded	6	N	2		
	2.15 P	29,900		83		thick	8	NNE	2		
8	7. A	29,932		78,8		thick	10	NE	1		(d)
	2.10 P	29,881		79,5		thick	10	NE	3		
9	7. A	29,940		74,3		thick	9	N	2	1,000	
	2.10 P	29,896		77		thick	8	NNE	3		(e)
10	1.43 A	☽ F. Q.									
	7.40 A	29,936		73		none		N	2		
	2. P	29,936		77,8		white ſcat.	3	NW	2		
11	7. A	30,022		74				N	2		(f)
	2. P	29,988		80		thick white ſc.	6	NW	2		
12	8. A	30,118		75		thick	3	NNE	2		
	2.30 P	30,036		79,3		thick	4	NNE	2		
13	8. A	30,118		74,3		thick	3	N	3		
	2. P	30,062		79		ſcattered	3	N	4		
14	7. A	30,082		71				N	3		
	2.25 P	30,024		78				NNW	3		
15	7.35 A	30,005		70,5				NW	3		
								Carried forward,	–	1,023	

(a) A ſmall ſhower at the gardens.

(b) Small rain: the produce at the gardens.

(c) It rained laſt night, and the water was meaſured this morning at the gardens. 2.20 P. At noon there was a ſmart ſhower of rain.

(d) Very gloomy and about to rain. 2.10 P. It began to rain about 8 o'clock, and it continued till near two. The ſky begins to brighten a little.

(e) Yeſterday at 3 P. it began to rain, and about 4 P. to blow, and the wind increaſed to great violence from the N and NE. About 7 P. a blaſt broke the pipe of the water-gage, at which time there was 0,5 in the ciſtern; and the quantity that fell afterwards was eſtimated at 0,5. The rain was heavy at times, and continued till one the next morning.

(f) Thick fog going off.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Nov. 1785. Miscellaneous.
								Brought forward,		1,023	
16	6.40 A	29,944		69,7							
	4.44 P	☽ Full						NW	2		
17	7.30 A	29,960		71,3	72,3			NW	2		(g)
	2.20 P	29,96		78,3				N	2		
18	7.45 A	30,036		72,5		thin	3	E	2		(h)
	2.15 P	30,013		78		ſcattered	4	WNW	2		
19	7.20 A	30,073		72		thick & thin	7	W	2		
	2.10 P	30,023		78,5		thin	4	WNW	3		
20	2.15 P	30,040		77,7		thin	3	NW	3		(i)
21	7.20 A	30,072		71,3		thick	9	N	2		(k)
	2.10 P	30,020		78		thick	6	E	2		
22	6.40 A	30,038		71,5		thick	9	ENE	4		(l)
	1.50 P	30,020		78		ſcattered	7	ENE	3		
23	7. A	29,986		72	67	thin	3	N	2		
	11.06 P	☽ Laſt									
24	8. A	29,976		73		thick	10	NE	3		
	2. P	29,920		79,5		thin	6	N	2		
25	7.30 A	29,942		72		thin	4	N	3		
28	6.20 A				59,7			N	4		(m)
	7.10 A	30,050		66,2	59,3	thin, a ſtripe in the eaſt		N	4		
	2. P	30,000		73		none		N	3		
29	7.25 A	30,022		66,5	58	none		N	3		(n)
	2.10 P	29,963		75,5				N	3		
30	6.40 A	29,977		66	59			N	3		
	2.30 P	29,940		77,3				NNW	3		
								TOTAL IN NOVEMBER,		1,023	

(g) The thermometer out was in the ſun.
(h) Thin fog.
(i) This morning was very cold, but I did not obſerve.
(k) It rained about three in the morning.
(l) Very ſharp wind abroad.
(m) One very ſmall cloud. 7.10 A. Foul ſky in the Weſt. 2. P. Not a ſingle cloud to be ſeen; the ſmall ſtripe went off before 8, and the whole day has been delightfully pleaſant.
(n) Yeſterday ended as delightful as it was at noon; and to-day promiſes to be juſt as fair and pleaſant.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kinds.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain. Inches.	Dec. 1785. Miscellaneous.
1	6.45 A	29,988		66,5	61	thin	2	W	2		
	2. P	29,976		78,2		ſcattered	3	NW	2		
2	2.42 A	☽ New									
	7.15 A	29,956		67	62	thin & thick ſca.	5	W	2		
	2. P	29,944		77,5				WNW	4		
3	7. A	30,00		69	64	thin	4	WNW	2		
	2.20 P	29,86		77		thin	4	N	2		
4	7. A	30,032		66,4	59			N	2		
5	7.			65				N	2		(a)
	2. P				74			WNW	2		
6	7.10 A	29,070		68				WSW	2		(b)
7	7. A				67,5			WSW	3		(c)
8	6.40 A				68			WNW	2		
9	6.30 A				52						(d)
	10.46 A	☽ F.Q.									
	2.20 P	30.044		79.5	77,5			WNW	3		
10	6.30 A	29.966		57	51						(e)
15	11. P	30.060		58							
16	4.30 A	☽ Full									
	6. A	30,050		53	48,5			NNW	3		
	2. P	30,040		76,3	74,8			W	1		

(a) At *Purree Baugh*.
(b) Foggy.
(c) Foggy.
(d) At *Dumdum* in tents: thermometer wet with the dew.
(e) Very thick fog.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Dec. 1785. Miscellaneous.
17	6. A	29,977		62	53	thick	8				(f)
	2. P			67	73	thick	5	NW	2		
18	6. A			62		thin	5	NW	2		
19	6. A	29,963		67	52	thin	5	N	2		
	2. P	29,944		78	78	thin	6	N	3		
20	2 20 P	29,976		77	78	thin & thick	6	ENE	3		(g)
21	7. A	30,00		58	53	thick	4	E	3		(h)
	2. P	29,944		78,5	77,5	thick	8	NE	2		
22	6.30 A	30,012		57,8	53			N	2		
	1. P	30,025		79,5	76	thick	9	N	3		
23	7.20 A	30,003	45	64,5	61	none		NNE	2		
	2.35 P	29,965		72	75			NNW	2		(i)
	8.01 P	☽ L. Q.									
24	7. A	30,024	43	67	60			NW by N	3		
25	6.40 A				59,5			NNE	3		
26	6.30 A				55			NW	2		
27	6.30 A				55			WNW	2		
	2.30 P	29,934			73			WNW	3		
29	8. A	30,088		69	59			NW by W	2		
	2.40 P	30,002		71,2	74,7			WNW	3		
31	6.31 P	☽ New									

(f) Laſt night the wind was South of the Weſt. At the gardens.
(g) In the morning it was E. 4.
(h) Exceſſive fog, but going off.
(i) At the gardens.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Jan. 1785. Miscellaneous.
1	7. A	30,128		72,5	60			WNW	2		
3	8. A	30,116		70	63,5			W½S	2		(a)
4	8. A	30,114		69,7	62,5	thin	5	W by N	2		
	1.10 P	30,064		71,5	74	thin	6	WNW	2		
5	8.48 A	30,144		69,5	66,5	thin	2	NW	3		
6	8. A	30,212		69	61			N	3		
	2.30 P	30,172		75,5	75			N½W	4		
7	8.10 A	30,248		68,5	59			NNW	3		
	6.37 P	☽ First									
11	2. P	30,042		69,5	73,5			N	3		(b)
12	9. A	30,107		64	61	thin	2	NW	3		
	3. P	30,004		72	73	thick	3	NW by N	2		
13	8.30 A	30,078		59,5	66,5	none		NW	3		
	2 15 P	29,998		69	73			WNW	2		
14	8. A	30,124		67,6	57			NW	3		
	2.15 P	30,074		70	72,5			WNW	3		
	6.30 P	☽ Full									
15	7.30 A	30,124		66	56,5			NW½N	3		
	2.30 P	30,050		70,5	72,3			NW by N	3		
16	6 A				52			NW	3		(c)
	2.20 P				78			NW	3		

(a) A fog so thick hardly any thing is visible.
(b) To-day at day-break it was 52 at *Dumdum*.
(c) Foggy, and piercing by cold.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Jan. 1786. Miscellaneous.
17	6. A				50			NNW	3		
	2. P				79			NW	3		
18	6. A				49			NW	0		(d)
19	7. A	30,040		66,5	56,5			NW	2		(e)
	2.20 P				82			WNW	4		
20	6.30 A				50			W	4		
	2. P				80			W	4		
22	5.42 P	☽ Laſt									
23	6. A				47			N	3		(f)
24	6. A				50			ENE	2		
25	6. A				60			S	2		
26	7. A				68			NW	2		
	2. P				84						
27	8. A				64						
	2. P				87			W	1		
29	7 45 A				65			NE	3		(g)
	2.50 P				85			NNE	3		
30	8.00 A	☽ New									
	8.32 A				64	thick ſcat.	4	WSW	1		(b)
	2.35 P				83			NNE	4		

(d) Fog, and thermometer wet: the air mild to the feeling.
(e) Foggy.
(f) Thermometer wet with dew.
(g) Thermometer wet with dew.
(b) Sun eclipſed, going off.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Feb. 1786. Miscellaneous.
1	7.15 A	29,994		72,3	67			SW	2		(a)
2	6.50 A	29,927		69,5	66	thick	3	SSW	3		(b)
3	7.45 A	30,036		67,5	63,5			N by W	3		
	2.30 P	30,009		76	75			NW	4		
4	6.30 A	30,047		67	55			WNW	3		
	2.30 P	30,060		77	75			NW by W	4		
6	2.22 A	☽ First									
	6.40 A	30,100		67	58,5			W	3		
	2.50 P	30,078		78	77			NW	4		
7	7.00 A	30,078		66	57,5			NW½N	3		
	3.30 P	30,020		73	77,5			NW½N	3		
8	7.15 A	30,068		66	59			NW½N	3		
10	6.50 A	30,084		68	58			WNW	3		
	2.40 P	30,087		79	79,3			W by N	3		
11	6.50 A	30,094		69	59			W by N	3		(c)
	2.30 P	30,026		71	80,7			E¼S	3		
12	7 50 A	30,00		69,3	65,5			N	2		
13	7.30 A	30,00		73,2	68,3			SW by S	2		(d)
	10.35 A	☽ Full									
	2. P	29,956		80,5	81,3			SW	2		
14	5.50 A	29,970		71,5	66			S½E	2		(e)

(a) Exceſſive fog.
(b) Thick fog riſing into clouds.
(c) Foggy.
(d) Exceſſive fog.
(e) Exceſſive fog.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Feb. 1786. Miscellaneous.
15	1.40 P				86	thick	6	S	4		(f)
16	7. A				64	thick	3	ESE	2		(g)
	2.10 P	29,914		76	79,5	thunder	10	SSW	2		
	6. P.									,1600	
17	7.50 A	29,952		70,3	64,3	thick	10	SE	5	,4200	(b)
18	7.40 A	29,992		65,5	61,3	thick scat.	5	NNE	3	,1750	(i)
19	8.10 A	30,02		65	65			WNW	4		
21	7.40 A	29,892		69	65,4			SW½S	3		
	2.11 P	☾ Laft									
22	6. P	29,882		77	77	thick thund.	7	S	3		(k)
23	8. A	29,970		74	75	thick	10	SSW	3		(l)
24	2.30 P	29,982		76	80,8	thick	6	NW	3	,1800	(m)
25	8. A	30,062		74	73,5			S by E	2		
	2.30 P	30,000		78	82	thick	4	ENE½N	2		
26	7.15 A	30,076		73	69,3	thick	10	NNW	2		(n)
	2.30 P	30,066		78,5	80,5	ditto	10	N by E	3		
27	7.10 A	30,095		72,5	70,3	ditto	10	NW	2		
28	2.20 P	30,058		77	85	thunder	6	W	2		(o)
	8.20 P	☽ New									
								TOTAL IN FEBRUARY,		0,936	

(f) The clouds have been thick 9, and it looked as if it was about to rain.

(g) Foggy (at Dumdum). 2.10 P. (At the Gardens) thunder coming on and drawing near. 6. P. Rain had began in drops when laft obfervation was made, there was thunder but not any thunder guft.

(b) It has been a very tempeftuous night with exceffively heavy thunder, and of very long continuance, the thunder fhook the whole houfe feveral times.

(i) This fell in the laft night.

(k) The wind has been S.6 the greateft part of the day

(l) It lightened a good deal till 8 P, and then cleared fuddenly.

(m) This water fell in a thunder fhower laft night, from the W and NW with much lightning, though but little wind.

(n) Much lightning in the former part of the night, and a guft of wind from N about 11.

(o) Very heavy fog this morning, and a mafs forming.

ASIATICK RESEARCHES:

OR,

TRANSACTIONS

OF THE

SOCIETY INSTITUTED IN BENGAL,

FOR INQUIRING INTO THE

HISTORY AND ANTIQUITIES, THE ARTS, SCIENCES, AND LITERATURE,

OF

A S I A.

VOLUME THE SECOND.

ADVERTISEMENT.

IT may greatly conduce to the advancement of uſeful knowledge, if the learned ſocieties, eſtabliſhed in *Europe*, will tranſmit to the Secretary of the Society in *Bengal* a collection of ſhort and preciſe queries on every branch of *Aſiatick* Hiſtory, natural and civil, on the Philoſophy, Mathematicks, Antiquities, and Polite Literature, of *Aſia*, and on eaſtern Arts, both liberal and mechanick; ſince it is hoped, that accurate anſwers may in due time be procured to any queſtions, that can be propoſed on thoſe ſubjects, which muſt in all events be curious and intereſting, and may prove in the higheſt degree beneficial to mankind.

I.

THE FOURTH ANNIVERSARY DISCOURSE, DELIVERED 15 FEBRUARY, 1787. *See the Works of Sir William Jones, Vol. I. p. 35.*

II.

THE FIFTH ANNIVERSARY DISCOURSE, DELIVERED 21 FEBRUARY, 1788. *See the Works of Sir William Jones, Vol. I. p. 51.*

III.

THE SIXTH ANNIVERSARY DISCOURSE, DELIVERED 19 FEBRUARY, 1789. *See the Works of Sir William Jones, Vol. I. p. 73.*

IV.

A LETTER FROM THE LATE HENRY VANSITTART, ESQ. TO THE PRESIDENT.

SIR,

HAVING ſome time ago met with a *Perſian* abridgement, compoſed by *Maulavì* KHAIRU'DD'IN, of the *Aſráru'l afághinah*, or the ſecrets of the *Afghàns*, a book written in the *Puſhto* language by HUSAIN, the ſon of SA'BIR, the ſon of KHIZR, the diſciple of *Hazrat* SHA'H KA'SIM *Sulaimánì*, whoſe tomb is in *Chunárgur*, I was induced to tranſlate it. Although it opens with a very wild deſcription of the origin of that tribe, and contains a narrative, which can by no means be offered upon the whole as a ſerious and probable hiſtory, yet I conceive, that the knowledge of what a nation ſuppoſe themſelves to be, may be intereſting to a ſociety like this, as well as of what they really are: indeed the commencement of almoſt every

every hiſtory is fabulous; and the moſt enlightened nations, after they have arrived at that degree of civilization and importance, which has enabled and induced them to commemorate their actions, have always found a vacancy at their outſet, which invention, or at beſt preſumption, muſt ſupply. Such fictions appear at firſt in the form of traditions; and, having in this ſhape amuſed ſucceſſive generations by a gratification of their national vanity, they are committed to writing, and acquire the authority of hiſtory.

As a kingdom is an aſſemblage of component parts, condenſed by degrees, from ſmaller aſſociations of individuals, to their general union, ſo hiſtory is a combination of the tranſactions not only of the different tribes, but even of the individuals of the nation, of which it treats: each particular narrative in ſuch a general collection muſt be ſummary and incomplete. Biography therefore, as well as deſcriptions of the manners, actions, and even opinions of ſuch tribes, as are connected with a great kingdom, are not only entertaining in themſelves, but uſeful; as they explain and throw a light upon the hiſtory of the nation.

Under theſe impreſſions, I venture to lay before the Society the tranſlation of an abridged hiſtory of the *Afghàns*, a tribe at different times ſubject to, and always connected with, the kingdoms of *Perſia* and *Hinduſtàn*. I alſo ſubmit a ſpecimen of their language, which is called by them *Pukhto*; but this word is ſoftened in *Perſian* into *Puſhto*.

I am, Sir,

With the greateſt reſpect,

Your moſt obedient humble ſervant,

HENRY VANSITTART.

Calcutta, March 3, 1784.

ON

ON THE DESCENT OF THE AFGHANS FROM THE JEWS.

THE *Afghàns*, according to their own traditions, are the poſterity of MELIC TA'LU'T (king SAUL), who, in the opinion of ſome, was a deſcendant of JUDAH, the ſon of JACOB, and according to others, of BENJAMIN, the brother of JOSEPH.

In a war, which raged between the children of *Iſrael* and the *Amalekites*, the latter, being victorious, plundered the *Jews*, and obtained poſſeſſion of the ark of the covenant. Conſidering this the God of the *Jews*, they threw it into fire, which did not affect it. They afterwards attempted to cleave it with axes, but without ſucceſs: every individual, who treated it with indignity, was puniſhed for his temerity. They then placed it in their temple, but all their idols bowed to it. At length they faſtened it upon a cow, which they turned looſe in the wilderneſs.

When the Prophet SAMUEL aroſe, the children of *Iſrael* ſaid to him: "We "have been totally ſubdued by the *Amalekites*, and have no king. Raiſe to us a "king, that we may be enabled to contend for the glory of God." SAMUEL ſaid: "In caſe you are led out to battle, are you determined to fight?" They anſwered: "What has befallen us, that we ſhould not fight againſt infidels? That "nation has baniſhed us from our country and children." At this time the Angel GABRIEL deſcended, and, delivering a wand, ſaid: "It is the command of GOD, "that the perſon whoſe ſtature ſhall correſpond with this wand ſhall be king of "*Iſrael*."

MELIC TA'LU'T was at that time a man of inferiour condition, and performed the humble employment of feeding the goats and cows of others. One day a cow under his charge was accidentally loſt. Being diſappointed in his ſearches, he was greatly diſtreſſed, and applied to SAMUEL, ſaying, "I have loſt a cow, "and do not poſſeſs the means of ſatisfying the owner. Pray for me, that I "may be extricated from this difficulty." SAMUEL, perceiving that he was a man of lofty ſtature, aſked his name. He anſwered TA'LU'T. SAMUEL then ſaid: "Meaſure TA'LU'T with the wand, which the Angel GABRIEL brought." His ſtature was equal to it. SAMUEL then ſaid: "GOD has raiſed TA'LU'T to "be your king." The children of *Iſrael* anſwered; "We are greater than our king. "We are men of dignity, and He is of inferiour condition. How, ſhall He be "our king?" SAMUEL informed them, they ſhould know, that God had conſti-

tuted

tuted TA'LU'T their king, by his reſtoring the ark of the covenant. He accordingly reſtored it, and they acknowledged him their ſovereign.

After TA'LU'T obtained the kingdom, he ſeized part of the territories of JALU'T, or GOLIAH, who aſſembled a large army, but was killed by DAVID. TA'LU'T afterwards died a martyr in a war againſt the infidels; and God conſtituted DAVID king of the *Jews*.

MELIC TA'LU'T had two ſons, one called BERKIA, and the other IRMIA, who ſerved DAVID, and were beloved by him. He ſent them to fight againſt the infidels; and, by GOD's aſſiſtance, they were victorious.

The ſon of BERKIA was called AFGH'AN, and the ſon of IRMIA was named USBEC. Thoſe youths diſtinguiſhed themſelves in the reign of DAVID, and were employed by SOLOMON. AFGH'AN was diſtinguiſhed by his corporal ſtrength, which ſtruck terror into Demons and Genii. USBEC was eminent for his learning.

AFGH'AN uſed frequently to make excurſions to the mountains; where his progeny, after his death, eſtabliſhed themſelves, lived in a ſtate of independence, built forts, and exterminated the infidels.

When the ſelect of creatures, MUHAMMED, appeared upon earth, his fame reached the AFGH'ANS, who fought him in multitudes under their leaders KHALID and ABDUL RASHI'D, ſons of WAL'ID. The prophet honoured them with the moſt gracious reception, ſaying: "Come, O *Mulùc*, or Kings;" whence they aſſumed the title of *Melic*, which they enjoy to this day. The prophet gave them his enſign, and ſaid that the faith would be ſtrengthened by them.

Many ſons were born of KHA'LID, the ſon of WAL'ID, who ſignalized themſelves in the preſence of the prophet, by fighting againſt the infidels. MUHAMMED honoured and prayed for them.

In the reign of Sultan MAHMU'D of *Ghaznah*, eight men arrived, of the poſterity of KHA'LID, the ſon of WAL'ID, whoſe names were KALUN, ALUN, DAUD, YALUA, AHMED, AWIN, and GHA'ZI'. The ſultan was much pleaſed with them, and appointed each a commander in his army. He alſo conferred on them the offices of *Vazír*, and *Vakíli Mutlak*, or Regent of the Empire.

Wherever they were ſtationed, they obtained poſſeſſion of the country, built moſques, and overthrew the temples of idols. They encreaſed ſo much, that the army of MAHMU'D was chiefly compoſed of *Afghàns*. When HERHIND, a powerful prince of *Hinduſtàn*, meditated an invaſion of *Ghaznah*, Sultan MAHMU'D diſpatched

diſpatched againſt him the deſcendants of KHA'LID with twenty thouſand horſe: a battle enſued; the *Afghàns* made the attack; and, after a ſevere engagement, which laſted from daybreak till noon, defeated HERHIND, killed many of the infidels, and converted ſome to the *Muhammedan* faith.

The *Afghàns* now began to eſtabliſh themſelves in the mountains; and ſome ſettled in cities with the permiſſion of Sultan MAHMU'D. They framed regulations, dividing themſelves into four claſſes, agreeably to the following deſcription. The firſt is the *pure* claſs, conſiſting of thoſe, whoſe fathers and mothers were *Afghàns*. The ſecond claſs conſiſts of thoſe, whoſe fathers were *Afghàns*, and mothers of another nation. The third claſs contains thoſe, whoſe mothers were *Afghàns*, and fathers of another nation. The fourth claſs is compoſed of the children of women, whoſe mothers were *Afghàns*, and fathers and huſbands of a different nation. Perſons, who do not belong to one of the claſſes, are not called *Afghàns*.

After the death of Sultan MAHMU'D they made another ſettlement in the mountains. SHIHA'BUDDI'N *Gaurì*, a ſubſequent Sultan of *Ghaznah*, was twice repulſed from *Hinduſtàn*. His *Vazìr* aſſembled the people, and aſked, if any of the poſterity of KHA'LID were living. They anſwered: "Many now live in a "ſtate of independence in the mountains, where they have a conſiderable army." The *Vazìr* requeſted them to go to the mountains, and by entreaties prevail on the *Afghàns* to come; for they were the deſcendants of companions of the prophet.

The inhabitants of *Ghaznah* undertook this embaſſy, and, by entreaties and preſents, conciliated the minds of the *Afghàns*, who promiſed to engage in the ſervice of the Sultan, provided he would himſelf come and enter into an agreement with them. The Sultan viſited them in their mountains, honoured them, and gave them dreſſes and other preſents. They ſupplied him with twelve thouſand horſe, and a conſiderable army of infantry. Being diſpatched by the Sultan before his own army, they took *Dehli*, killed *Roy Pahtoura* the king, his miniſters and nobles; laid waſte the city, and made the infidels priſoners. They afterwards exhibited nearly the ſame ſcene in *Canauj*.

The Sultan, pleaſed by the reduction of thoſe cities, conferred honours upon the *Afghàns*. It is ſaid that he then gave them the titles of *Patan* and *Khan*. The word *Patan* is derived from the *Hindi* verb *Paitna*, *to ruſh*, in alluſion to their alacrity in attacking the enemy. The *Patans* have greatly diſtinguiſhed themſelves in the hiſtory of *Hinduſtan*, and are divided into a variety of ſects.

The race of *Afghàns* poſſeſſed themſelves of the mountain of SOLOMON, which is near *Kandahàr*, and the circumjacent country, where they have built forts: this tribe has furniſhed many kings. The following monarchs of this race have ſat upon the throne of *Dehlì*: Sultan *Behlole*, *Afghàn* LOD'I, Sultan SECANDER, Sultan IBRA'HI'M, SHI'R SHA'H, ISLAM SHA'H, ADIL SHA'H SU'R. They alſo number the following kings of *Gaur*; SOLAIM'AN *Shàh Gurzani*, BAYAZI'D *Shàh*, and KUTB *Shàh*; beſides whom their nation has produced many conquerors of provinces. The *Afghàns* are called *Solaimánì*, either becauſe they were formerly the ſubjects of SOLOMON, king of the *Jews*, or becauſe they inhabit the mountain of SOLOMON.

The tranſlation being finiſhed, I ſhall only add, that the country of the *Afghàns*, which is a province of *Cábul*, was originally called *Roh*, and from hence is derived the name of the *Rohillahs*. The city, which was eſtabliſhed in it by the *Afghàns*, was called by them *Paiſhwer*, or *Paiſhòr*, and is now the name of the whole diſtrict. The ſects of the *Afghàns*, or *Patàns*, are very numerous. The principal are theſe: *Lodì*, *Lohauni*, *Sùr*, *Serwánì*, *Yúſufzihi*, *Bangiſh*, *Dilazai*, *Khattì*, *Yasìn*, *Khail*, and *Baloje*. The meaning of *Zihì* is offſpring, and of *Khail*, ſect. A very particular account of the *Afghàns* has been written by the late HA'FIZ RAHMAT KHAN, a chief of the *Rohillahs*, from which the curious reader may derive much information. They are *Muſelmans*, partly of the *Sunni*, and partly of the *Shiah* perſuaſion. They are great boaſters of the antiquity of their origin, and reputation of their tribe, but other *Muſelmans* entirely reject their claim, and conſider them of modern, and even baſe, extraction. However, their character may be collected from hiſtory. They have diſtinguiſhed themſelves by their courage, both ſingly and unitedly, as principals and auxiliaries. They have conquered for their own princes and for foreigners, and have always been conſidered the main ſtrength of the army, in which they have ſerved. As they have been applauded for virtues, they have alſo been reproached for vices, having ſometimes been guilty of treachery, and even acted the baſe part of aſſaſſins.

A SPE-

A SPECIMEN OF THE PUSHTO LANGUAGE.

لِستمٓ ظَالِمانٓ حاکِمانٓ
اَوْر ڭٓوْرَ پېشَوَرْ دِرِي وَاْ رَه يَوْ دِيْ

By the oppreſſion of tyrannical rulers,
Fire, the grave, and *Paiſhor*, all three have been rendered equal.

دَ سٓبنَتٓ و پرٓخْصَتَ دَيْ رَاْ غَلِيْ رَوَا پَتْ

With reſpect to prayers enjoined by the *Sunnah*, they are remitted.
It is thus expreſſed in the reports:

کَايْ اُو کَاد يْرَهَ شَهِوِيْ کَايْ نَکَهِ هيْسْ پِرِيْ نَوِيْ

If a *man* perform them, it is very laudable. If he do not perform them, it is no crime in him.

مير زا خان
اِي مِير زَا کَهَ دَ خُوْيِ بِهتْرِيْ نَوِيْ
دَ سَيِّد تَفَا وَتْ سهِ دَيْ لَهَ بَامنَهَ

If the diſpoſition be not good, *O Mirza*,
What difference is there between a *Sayyed* and a *Brahman*?

NOTE TO MR. VANSITTART'S PAPER ON THE AFGHANS BEING DESCENDED FROM THE JEWS. *See the Works of Sir William Jones, Vol. I. p.* 331.

V. RE-

V.

REMARKS ON THE ISLAND OF HINZUAN, OR JOHANNA. *See the Works of Sir William Jones, Vol. I. p.* 485.

VI.

ON THE BAYA, OR INDIAN GROSS-BEAK. *See the Works of Sir William Jones, Vol. I. p.* 543.

VII.

ON THE CHRONOLOGY OF THE HINDUS. *See the Works of Sir William Jones, Vol. I. p.* 281.

VIII.

ON THE CURE OF THE ELEPHANTIASIS. *See the Works of Sir William Jones, Vol. I. p.* 549.

ON THE CURE OF THE ELEPHANTIASIS, AND OTHER DISORDERS OF THE BLOOD. *See the Works of Sir William Jones, Vol. I. p.* 553.

IX.

ON THE INDIAN GAME OF CHESS. *See the Works of Sir William Jones, Vol. I. p.* 521.

X. TWO

X.

TWO INSCRIPTIONS FROM THE VINDHYA MOUNTAINS, TRANSLATED FROM THE SANSCRIT BY CHARLES WILKINS, ESQ.

FIRST INSCRIPTION,

In a Cavern, called the Grot of the Seven Riſhi's, *near* Gaya.

1. ANANTA VARMA, maſter of the hearts of the people, who was the good ſon of *Sree* SARDOOLA, by his own birth and great virtues claſſed amongſt the principal rulers of the earth, gladly cauſed this ſtatue of KREESHNA of unſullied renown, confirmed in the world like his own reputation, and the image of KANTEEMATEE *, to be depoſited in this great mountain-cave.

2. *Sree* SARDOOLA, of eſtabliſhed fame, jewel of the diadems of kings, emblem of time to the martial poſſeſſors of the earth, to the ſubmiſſive the tree of the fruit of deſire, a light to the Military Order, whoſe glory was not founded upon the feats of a ſingle battle, the raviſher of female hearts, and the image of SMARA †, became the ruler of the land.

3. Wherever *Srēē* SARDOOLA is wont to caſt his own diſcordant ſight towards a foe, and the fortunate ſtar, his broad eye is enflamed with anger between its expanded lids, *there* falleth a ſhower of arrows from the ear-drawn ſtring of the bow of his ſon, the renowned ANANTA VARMA, the beſtower of infinite happineſs.

SECOND INSCRIPTION,

In a Cave behind Nagarjeni.

1. THE auſpicious *Srēē* YAJNA VARMA, whoſe movement was as the ſportive elephant's in the ſeaſon of luſt, was, like MANOO ‡, the appointer of the military

* RADHA, the favourite Miſtreſs of KREESHA.

† KAMA DEVA the *Cupid* of the *Hindoos*.

‡ The firſt legiſlator of the *Hindoos*.

ſtation

ſtation of all the chiefs of the earth.—By whoſe divine offerings, the God with a thouſand eyes * being conſtantly invited, the emaciated *Powlōmēē* †, for a long time, ſullied the beauty of her cheeks with falling tears.

2. ANANTA VARMA by name, the friend of ſtrangers; renowned in the world in the character of valour; by nature immaculate as the lunar beams, and who is the offspring of *Srēē* SARDOOLA:—By him this wonderful ſtatue of BHOOTAPATEE and of DEVEE ‡, the maker of all things viſible and inviſible and the granter of boons, which hath taken ſanctuary in this cave, was cauſed to be made. May it protect the univerſe!

3. The ſtring of his expanded bow, charged with arrows and drawn to the extremity of the ſhoulder, burſteth the circle's centre. Of ſpacious brow, propitious diſtinction, and ſurpaſſing beauty, he is the image of the moon with an undimiſhed countenance. ANANTA VARMA to the end! Of form like SMARA § in exiſtence, he is ſeen with the conſtant and affectionate ſtanding with their tender and faſcinated eyes conſtantly fixed upon him.

4. From the machine his bow, reproacher of the crying *Kŏŏrără* ‖, bent to the extreme, he is endued with force; from his expanded virtue he is a provoker; by his good conduct his renown reacheth to afar; he is a hero by whoſe courſing ſteeds the elephant is diſturbed, and a youth who is the ſeat of ſorrow to the women of his foes. He is the director, and his name is ANANTA **.

* *Ĕĕndră*, a deification of the Heavens.

† The wife of *Ĕĕndră*.

‡ *Sĕĕvă*, or *Măhādēvă* and his conſort in one image, as a type of the deities, *Genitor* and *Genitrix*.

§ The Hindoo *Cupid*.

‖ A bird that is conſtantly making a noiſe before rain.

** This word ſignifies eternal or infinite.

XI.

A DESCRIPTION OF AS'AM BY MOHAMMED CAZIM, TRANSLATED FROM THE PERSIAN BY HENRY VANSITTART, ESQ.*

AS'AM, which lies to the north-eaſt of *Bengal*, is divided into two parts by the river *Brahmaputra*, that flows from *Khatà*. The northern portion is called *Uttarcul*, and the ſouthern *Dacſhincul*. *Uttarcul* begins at *Gowahutty*, which is the boundary of his Majeſty's territorial poſſeſſions, and terminates in mountains inhabited by a tribe called *Meeri Mechmi*. *Dacſhincul* extends from the village *Sidea* to the hills of *Srinagar*. The moſt famous mountains to the northward of *Uttarcul* are thoſe of *Duleh* and *Landah*; and to the ſouthward of *Dacſhincul* are thoſe of *Namrup (Cámrùp?)*, ſituated four days' journey above *Ghergong*, to which the *Rájá* retreated. There is another chain of hills, which is inhabited by a tribe called *Nanac*, who pay no revenue to the *Rájá*, but profeſs allegiance to him, and obey a few of his orders. But the † *Zemleh* tribe are entirely independent of him, and, whenever they find an opportunity, plunder the country contiguous to their mountains. *Asàm* is of an oblong figure: its length is about 200 ſtandard coſs, and its breadth, from the northern to the ſouthern mountains, about eight days' journey. From *Gowahutty* to *Ghergong* are ſeventy-five ſtandard coſs; and from thence it is fifteen days' journey to *Khoten*, which was the reſidence of *Peeran Wiſeh* ‡, but is now called *Ava* §, and is the capital of the *Rájá* of *Pegu*, who conſiders himſelf of the poſterity of that famous general. The firſt five days' journey from the mountains of *Cámrùp* is performed through foreſts, and over hills, which are arduous and difficult to paſs. You then travel eaſtward to *Ava* through a level and ſmooth country. To the northward is the plain of *Khatá*, that has been before mentioned as the place from whence the *Brahmaputra* iſſues, which is afterwards fed by ſeveral rivers that flow from the ſouthern mountains of *Asàm*. The principal of

* This account of *Asàm* was tranſlated for the ſociety, but afterwards printed by the learned tranſlator as an appendix to his *Aálemgírnámah*. It is reprinted here, becauſe our government has an intereſt in being as well acquainted as poſſible with all the nations *bordering* on the *Britiſh* territories.

† In another copy this tribe are called *Duſleh*.

‡ According to *Khonaemir*, *Peeran Wiſeh* was one of the nobles of *Afraſiab*, king of *Turàn*, contemporary with *Kaicaus*, ſecond prince of the *Kianian* Dynaſty. In the *Ferhung Jehangeery* and *Borhaun Kateâ* (two Perſian dictionaries), *Peeran* is deſcribed as one of the *Pehlovan* or heroes of *Turàn*, and general under *Afraſiab*, the name of whoſe father was *Wiſeh*.

§ This is a palpable miſtake. *Khoten* lies to the north of *Himálaya*; and *Pírán Viſah* could never have ſeen *Ava*.

theſe

theſe is the *Dhonec*, which has before occurred in this hiſtory. It joins that broad river at the village *Luckeigereh*.

Between theſe rivers is an iſland well inhabited, and in an excellent ſtate of tillage. It contains a ſpacious, clear, and pleaſant country, extending to the diſtance of about fifty coſs. The cultivated tract is bounded by a thick foreſt, which harbours elephants, and where thoſe animals may be caught, as well as in four or five other foreſts of *Asàm*. If there be occaſion for them, five or ſix hundred elephants may be procured in a year. Acroſs the *Dhonec*, which is the ſide of *Ghergong*, is a wide, agreeable, and level country, which delights the heart of the beholder. The whole face of it is marked with population and tillage; and it preſents on every ſide charming proſpects of ploughed fields, harveſts, gardens, and groves. All the iſland before deſcribed lies in *Dacſhincul*. From the village *Selagereh* to the city of *Ghergong* is a ſpace of about fifty coſs, filled with ſuch an uninterrupted range of gardens, plentifully ſtocked with fruit-trees, that it appears as one garden. Within them are the houſes of the peaſants, and a beautiful aſſemblage of coloured and fragrant herbs, and of garden and wild flowers blowing together. As the country is overflowed in the rainy ſeaſon, a high and broad cauſſey has been raiſed for the convenience of travellers from *Salagereh* to *Ghergong*, which is the only uncultivated ground that is to be ſeen. Each ſide of this road is planted with ſhady bamboos, the tops of which meet, and are intertwined. Amongſt the fruits which this country produces, are mangoes, plantains, jacks, oranges, citrons, limes, pine-apples, and *punialeh*, a ſpecies of *amleh*, which has ſuch an excellent flavour, that every perſon who taſtes it prefers it to the plum. There are alſo cocoa-nut trees, pepper vines, *areca* trees, and the *ſádij**, in great plenty. The ſugar-cane excels in ſoftneſs and ſweetneſs, and is of three colours, red, black, and white. There is ginger free from fibres, and betel vines. The ſtrength of vegetation and fertility of the ſoil are ſuch, that whatever ſeed is ſown, or ſlips planted, they always thrive. The environs of *Ghergong* furniſh ſmall apricots, yams, and pomegranates; but as theſe articles are wild, and not aſſiſted by cultivation and engraftment, they are very indifferent. The principal crop of this country conſiſts in rice and *maſh* †. *Ades* is very ſcarce, and wheat and barley are never ſown. The ſilks are excellent, and reſemble thoſe of *China*; but they manufacture very few more than are re-

* The *Sádij* is a long aromatick leaf, which has a pungent taſte, and is called in *Sanſcrit Téjapatra*. In our botanical books it bears the name of *Malabathrum*, or the *Indian* leaf.

† *Maſh* is a ſpecies of grain, and *Ades* a kind of pea.

quired

quired for uſe. They are ſucceſsful in embroidering with flowers, and in weaving velvet, and *tautbund*, which is a ſpecies of ſilk of which they make tents and *kenauts* *. Salt is a very precious and ſcarce commodity. It is found at the bottom of ſome of the hills, but of a bitter and pungent quality. A better ſort is in common uſe, which is extracted from the plantain tree. The mountains, inhabited by the tribe called *Nanac*, produce plenty of excellent *Lignum Aloes*, which a ſociety of the natives imports every year into *Asàm*, and barters for ſalt and grain. This evil-diſpoſed race of mountaineers are many degreee removed from the line of humanity, and are deſtitute of the characteriſtical properties of a man. They go naked from head to foot, and eat dogs, cats, ſnakes, mice, rats, ants, locuſts, and every thing of this ſort which they can find. The hills of *Cámrùp*, *Sidea*, and *Luckigereh*, ſupply a fine ſpecies of *Lignum Aloes*, which ſinks in water. Several of the mountains contain muſk-deer.

The country of *Uttarcul*, which is on the northern ſide of the *Brahmaputra*, is in the higheſt ſtate of cultivation, and produces plenty of pepper and *Areca*-nuts. It even ſurpaſſes *Dacſhincul* in population and tillage; but, as the latter contains a greater tract of wild foreſts, and places difficult of acceſs, the rulers of *Asàm* have choſen to reſide in it for the convenience of controul, and have erected in it the capital of the kingdom. The breadth of *Uttarcul*, from the bank of the river to the foot of the mountains, which is a cold climate, and contains ſnow, is various, but is no where leſs than fifteen coſs, nor more than forty-five coſs. The inhabitants of thoſe mountains are ſtrong, have a robuſt and reſpectable appearance, and are of a middling ſize. Their complexions, like thoſe of the natives of all cold climates, are red and white; and they have alſo trees and fruits peculiar to frigid regions. Near the fort of *Jum Dereh*, which is on the ſide of *Gowahutty*, is a chain of mountains, called the country of *Dereng*, all the inhabitants of which reſemble each other in appearance, manners, and ſpeech, but are diſtinguiſhed by the names of their tribes, and places of reſidence. Several of theſe hills produce muſk, *kataus* †, *bhoat* ‡, *peree*, and two ſpecies of horſes, called *goont* and *tanyans*. Gold and ſilver are procured here, as in the whole country of *Asàm*, by waſhing the ſand of the rivers. This, indeed, is one of the ſources of revenue. It is ſuppoſed that

* *Kenauts* are walls made to ſurround tents.

† Kataus is thus deſcribed in the *Borhaun Katea*: "This word, in the language of *Rùm*, is a ſeacow; the tail of "which is hung upon the necks of horſes, and on the ſummit of ſtandards. Some ſay that it is a cow which lives in "the mountains of *Khatà*." It here means the mountain-cow, which ſupplies the tail that is made into *chowries*, and in *Sanſcrit* is called *chámara*.

‡ *Bhoat* and *peree* are two kinds of blanket.

12,000 inhabitants, and ſome ſay, 20,000, are employed in this occupation; and it is a regulation, that each of theſe perſons ſhall pay a fixed revenue of a *tólà* * of gold to the *Rájá*. The people of *Asàm* are a baſe and unprincipled nation, and have no fixed religion. They follow no rule but that of their own inclinations, and make the approbation of their own vicious minds the teſt of the propriety of their actions. They do not adopt any mode of worſhip practiſed either by *Heathens* or *Mohammedans*; nor do they concur with any of the known ſects which prevail amongſt mankind. Unlike the Pagans of *Hinduſtàn*, they do not reject victuals which have been dreſſed by *Muſelmans*; and they abſtain from no fleſh except human. They even eat animals that have died a natural death; but, in conſequence of not being uſed to the taſte of ghee, they have ſuch an antipathy to this article, that if they diſcover the leaſt ſmell of it in their victuals, they have no reliſh for them. It is not their cuſtom to veil their women; for even the wives of the *Rájá* do not conceal their faces from any perſon. The females perform work in the open air, with their countenances expoſed, and heads uncovered. The men have often four or five wives each, and publickly buy, ſell, and change them. They ſhave their heads, beards, and whiſkers, and reproach and admoniſh every perſon who neglects this ceremony. Their language has not the leaſt affinity with that of *Bengal* †. Their ſtrength and courage are apparent in their looks; but their ferocious manners, and brutal tempers, are alſo betrayed by their phyſiognomy. They are ſuperior to moſt nations in corporal force and hardy exertions. They are enterprizing, ſavage, fond of war, vindictive, treacherous, and deceitful. The virtues of compaſſion, kindneſs, friendſhip, ſincerity, truth, honour, good faith, ſhame, and purity of morals, have been left out of their compoſition. The ſeeds of tenderneſs and humanity have not been ſown in the field of their frames. As they are deſtitute of the mental garb of manly qualities, they are alſo deficient in the dreſs of their bodies. They tie a cloth round their heads, and another round their loins, and throw a ſheet upon their ſhoulder; but it is not cuſtomary in that country to wear turbans, robes, drawers, or ſhoes. There are no buildings of brick or ſtone, or with walls of earth, except the gates of the city of *Ghergong*, and ſome of their idolatrous temples. The rich and poor conſtruct their habitations of wood, bamboos, and ſtraw. The *Rájá* and his courtiers travel in ſtately

* Eighty *rati*-weights.

† This is an error: young *Bráhmens* often come from *Asàm* to *Nadíyà* for inſtruction, and their vulgar dialect is underſtood by the *Bengal* teachers.

litters;

litters; but the opulent and reſpectable perſons amongſt his ſubjects are carried in lower vehicles, called doolies. *Asàm* produces neither horſes *, camels, nor aſſes; but thoſe cattle are ſometimes brought thither from other countries. The brutal inhabitants, from a congenial impulſe, are fond of ſeeing and keeping aſſes; and buy and ſell them at a high price; but they diſcover the greateſt ſurprize at ſeeing a camel; and are ſo afraid of a horſe, that if one trooper ſhould attack a hundred armed *Aſamians*, they would all throw down their arms and flee; or ſhould they not be able to eſcape, they would ſurrender themſelves priſoners. Yet, ſhould one of that deteſtable race encounter two men of another nation on foot, he would defeat them.

The ancient inhabitants of this country are divided into two tribes, the *Aſamians* and the *Cultanians*. The latter excel the former in all occupations except war, and the conduct of hardy enterpriſes, in which the former are ſuperior. A body-guard of ſix or ſeven thouſand *Aſamians*, fierce as demons, of unſhaken courage, and well provided with warlike arms and accoutrements, always keep watch near the *Rájá's* ſitting and ſleeping apartments; theſe are his loyal and confidential troops and patrol. The martial weapons of this country are the muſquet, ſword, ſpear, and arrow and bow of bamboo. In their forts and boats they have alſo plenty of cannon, *zerbzen* †, and *ramchangee*, in the management of which they are very expert.

Whenever any of the *Rájá's*, magiſtrates, or principal men die, they dig a large cave for the deceaſed, in which they inter his women, attendants, and ſervants, and ſome of the magnificent equipage and uſeful furniture, which he poſſeſſed in his lifetime, ſuch as elephants, gold and ſilver, *bádcaſh* (large fans), carpets, clothes, victuals, lamps, with a great deal of oil, and a torch-bearer; for they conſider thoſe articles as ſtores for a future ſtate. They afterwards conſtruct a ſtrong roof over the cave upon thick timbers. The people of the army entered ſome of the old caves, and took out of them the value of 90,000 rupees, in gold and ſilver. But an extraordinary circumſtance is ſaid to have happened, to which the mind of man can ſcarcely give credit, and the probability of which is contradicted by daily experience. It is this: All the nobles came to the Imperial General, and declared, with univerſal agreement, that a golden betel ſtand was found in one of the caves, that was dug eighty years before, which contained betel-leaf quite green and freſh; but the authenticity of this ſtory reſts upon report.

* As the author has aſſerted that two ſpecies of horſes, called *gonn* and *tanyans*, are produced in *Dereng*, we muſt ſuppoſe that this is a different country from *Asàm*.

† Swivels.

Ghergong

Ghergong has four gates, conſtructed of ſtone and earth; from each of which the *Rájá's* palace is diſtant three coſs. The city is encompaſſed with a fence of bamboos, and within it high and broad cauſſeys have been raiſed for the convenience of paſſengers during the rainy ſeaſon. In the front of every man's houſe is a garden, or ſome cultivated ground. This is a fortified city, which encloſes villages and tilled fields. The *Rájá's* palace ſtands upon the bank of the *Degoo*, which flows throughout the city. This river is lined on each ſide with houſes, and there is a ſmall market, which contains no ſhopkeepers except ſellers of betel. The reaſon is, that it is not cuſtomary for the inhabitants to buy proviſions for daily uſe, becauſe they lay up a ſtock for themſelves, which laſts them a year. The *Rájá's* palace is ſurrounded by a cauſſey, planted on each ſide with a cloſe hedge of bamboos, which ſerves inſtead of a wall. On the outſide there is a ditch, which is always full of water. The circumference of the encloſure is one coſs and fourteen jereebs. Within it have been built lofty halls, and ſpacious apartments for the *Rájá*, moſt of them of wood, and a few of ſtraw, which are called *chuppers*. Amongſt theſe is a *díwàn káhnah*, or publick ſaloon, one hundred and fifty cubits long, and forty broad, which is ſupported by ſixty-ſix wooden pillars, placed at an interval of about four cubits from each other. The *Rájá's* ſeat is adorned with lattice-work and carving. Within and without have been placed plates of braſs, ſo well poliſhed, that when the rays of the ſun ſtrike upon them, they ſhine like mirrors. It is an aſcertained fact, that 3000 carpenters and 12,000 labourers were conſtantly employed in this work, during two years, before it was finiſhed. When the *Rájá* ſits in this chamber, or travels, inſtead of drums and trumpets they beat the * *dhól* and *dand*. The latter is a round and thick inſtrument made of copper, and is certainly the ſame as the drum †, which it was cuſtomary, in the time of the ancient kings, to beat in battles and marches.

The *Rájá's* of this country have always raiſed the creſt of pride and vain-glory, and diſplayed an oſtentatious appearance of grandeur, and a numerous train of attendants and ſervants. They have not bowed the head of ſubmiſſion and obedience, nor have they paid tribute or revenue to the moſt powerful monarch; but they have curbed the ambition, and checked the conqueſts, of the moſt victorious princes of *Hinduſtàn*. The ſolution of the difficulties attending a war againſt them, has baffled the penetration of heroes, who have been ſtyled conquerors of the world. Whenever an invading army has entered their territories, the *Aſamians* have covered

* The *dhól* is a kind of drum, which is beaten at each end.

† This is a kind of kettle-drum, and is made of a compoſition of ſeveral metals.

themſelves

themſelves in ſtrong poſts, and have diſtreſſed the enemy by ſtratagems, ſurpriſes, and alarms, and by cutting off their proviſions. If theſe means have failed, they have declined a battle in the field, but have carried the peaſants into the mountains, burnt the grain, and left the country empty. But when the rainy ſeaſon has ſet in upon the advancing enemy, they have watched their opportunity to make excurſions, and vent their rage; the famiſhed invaders have either become their priſoners, or been put to death. In this manner powerful and numerous armies have been ſunk in that whirlpool of deſtruction, and not a ſoul has eſcaped.

Formerly HUSAIN SH'AH, a King of *Bengal*, undertook an expedition againſt *Asàm*, and carried with him a formidable force in cavalry, infantry, and boats. The beginning of this invaſion was crowned with victory. He entered the country, and erected the ſtandard of ſuperiority and conqueſt. The *Rájá* being unable to encounter him in the field, evacuated the plains, and retreated to the mountains. HUSAIN left his ſon, with a large army, to keep poſſeſſion of the country, and returned to *Bengal*. The rainy ſeaſon commenced, and the roads were ſhut up by the inundation. The *Rájá* deſcended from the mountains, ſurrounded the *Bengal* army, ſkirmiſhed with them, and cut off their proviſions, till they were reduced to ſuch ſtraights, that they were all, in a ſhort time, either killed or made priſoners.

In the ſame manner MOHAMMED *Shàh*, the ſon of TOGLUC *Shàh*, who was king of ſeveral of the provinces of *Hinduſtàn*, ſent a well-appointed army of a hundred thouſand cavalry to conquer *Asàm*; but they were all devoted to oblivion in that country of enchantment; and no intelligence or veſtige of them remained. Another army was diſpatched to revenge this diſaſter; but when they arrived in *Bengal*, they were panick-ſtruck, and ſhrunk from the enterprize; becauſe if any perſon paſſes the frontier into that diſtrict, he has not leave to return. In the ſame manner, none of the inhabitants of that country are able to come out of it, which is the reaſon that no accurate information has hitherto been obtained relative to that nation. The natives of *Hinduſtàn* conſider them as wizzards and magicians, and pronounce the name of that country in all their incantations and counter-charms. They ſay, that every perſon who ſets his foot there, is under the influence of witchcraft, and cannot find the road to return.

JEIDEJ SING *, the *Rájá* of *Asàm*, bears the title of *Swergì*, or *Celeſtial*. *Swerg*,

* Properly *Jayadhwaja Sinha*, or *the Lion with Banners of Conqueſt*.

in

in the *Hinduſtánì* language, means heaven. That frantick and vain-glorious prince is ſo exceſſively fooliſh and miſtaken, as to believe that his vicious anceſtors were ſovereigns of the heavenly hoſt; and that one of them, being inclined to viſit the earth, deſcended by a golden ladder. After he had been employed ſome time in regulating and governing his new kingdom, he became ſo attached to it, that he fixed his abode in it, and never returned.

In ſhort, when we conſider the peculiar circumſtances of *Asàm*; that the country is ſpacious, populous, and hard to be penetrated; that it abounds in perils and dangers; that the paths and roads are beſet with difficulties; that the obſtacles to the conqueſt of it are more than can be deſcribed; that the inhabitants are a ſavage race, ferocious in their manners, and brutal in their behaviour; that they are of a gigantick appearance, enterprizing, intrepid, treacherous, well armed, and more numerous than can be conceived; that they reſiſt and attack the enemy from ſecure poſts, and are always prepared for battle; that they poſſeſs forts as high as heaven, garriſoned by brave ſoldiers, and plentifully ſupplied with warlike ſtores, the reduction of each of which would require a long ſpace of time; that the way was obſtructed by thick and dangerous buſhes, and broad and boiſterous rivers: when we conſider theſe circumſtances, we ſhall wonder that this country, by the aid of GOD, and the auſpices of his Majeſty, was conquered by the Imperial army, and became a place for erecting the ſtandard of the faith. The haughty and inſolent heads of ſeveral of the deteſtable *Aſamians*, who ſtretch the neck of pride, and who are devoid of religion, and remote from GOD, were bruiſed by the hoofs of the horſes of the victorious warriors. The *Muſelman* heroes experienced the comfort of fighting for their religion; and the bleſſings of it reverted to the ſovereignty of his juſt and pious Majeſty.

The *Rájá*, whoſe ſoul had been enſlaved by pride, and who had been bred up in the habit of preſuming on the ſtability of his own government, never dreamt of this reverſe of fortune; but being now overtaken by the puniſhment due to his crimes, fled, as has been before mentioned, with ſome of his nobles, attendants, and family, and a few of his effects, to the mountains of *Cámrùp*. That ſpot, by its bad air and water, and confined ſpace, is rendered the worſt place in the world, or rather it is one of the pits of hell. The *Rájá's* officers and ſoldiers, by his orders, croſſed the *Dhonec*, and ſettled in the ſpacious iſland between that and the *Brahmaputra*, which contains numerous foreſts and thickets. A few took refuge in other mountains; and watched an opportunity of committing hoſtilities.

CA'MR'UP, is a country on the ſide of *Dacſhincul*, ſituated between three high mountains, at the diſtance of four days' journey from *Ghergong*. It is remarkable for bad water, noxious air, and confined proſpects. Whenever the *Rájá* uſed to be angry with any of his ſubjects, he ſent them thither. The roads are difficult to paſs, inſomuch that a foot-traveller proceeds with the greateſt inconvenience. There is one road wide enough for a horſe; but the beginning of it contains thick foreſts for about half a coſs. Afterwards there is a defile, which is ſtony and full of water. On each ſide is a mountain towering to the ſky.

The Imperial General remained ſome days in *Ghergong*, where he was employed in regulating the affairs of the country, encouraging the peaſants, and collecting the effects of the *Rájá*. He repeatedly read the *Khotbeh*, or prayer, containing the name and titles of the Prince of the age, King of Kings, ALEMGEER, Conqueror of the World, and adorned the faces of the coins with the Imperial impreſſion. At this time there were heavy ſhowers, accompanied with violent wind, for two or three days; and all the ſigns appeared of the rainy ſeaſon, which in that country ſets in before it does in *Hinduſtàn*. The General exerted himſelf in eſtabliſhing poſts, and fixing guards, for keeping open the roads and ſupplying the army with proviſions. He thought now of ſecuring himſelf during the rains, and determined, after the ſky ſhould be cleared from the clouds, the lightning ceaſe to illuminate the air, and the ſwelling of the water ſhould ſubſide, that the army ſhould again be ſet in motion againſt the *Rájá* and his attendants, and be employed in delivering the country from the evils of their exiſtence.

The Author then mentions ſeveral ſkirmiſhes, which happened between the *Rájá's* forces and the Imperial troops, in which the latter were always victorious. He concludes thus:

At length all the villages of *Dacſhincul* fell into the poſſeſſion of the Imperial army. Several of the inhabitants and peaſants, from the diffuſion of the fame of his Majeſty's kindneſs, tenderneſs, and juſtice, ſubmitted to his government, and were protected in their habitations and property. The inhabitants of *Uttarcul* alſo became obedient to his commands. His Majeſty rejoiced, when he heard the news of this conqueſt, and rewarded the General with a coſtly dreſs, and other diſtinguiſhing marks of his favour.

The Narrative to which this is a ſupplement, gives a conciſe hiſtory of the military expedition into *Asàm*. In this deſcription the Author has ſtopt at a period, when the Imperial troops had poſſeſſed themſelves of the capital, and were maſters

of

of any part of the plain country, which they choſe to occupy or over-run. The ſequel diminiſhes the credit of the conqueſt, by ſhowing that it was temporary, and that the *Rájá* did not forget his uſual policy of haraſſing the invading army during the rainy ſeaſon: but this conduct produced only the effect of diſtreſſing and diſguſting it with the ſervice, inſtead of abſolutely deſtroying it, as his predeceſſors had deſtroyed former adventurers. Yet the concluſion of this war is far from weakening the panegyrick which the Author has paſſed upon the Imperial General, to whom a difference of ſituation afforded an opportunity of diſplaying additional virtues, and of cloſing that life with heroick fortitude, which he had always hazarded in the field with martial ſpirit. His name and titles were, *Mír* JUMLEH, MOAZZIM *Khán*, *Kháni Khánán*, *Sipáhì* SA'LA'R.

REMARK.

The preceding account of the *Aſamians*, who are probably ſuperior in all reſpects to the *Moguls*, exhibits a ſpecimen of the black malignity and frantick intolerance, with which it was uſual, in the reign of AURANGZ'IB, to treat all thoſe whom the crafty, cruel, and avaricious Emperor was pleaſed to condemn as infidels and barbarians.

XII.

ON THE MANNERS, RELIGION, AND LAWS OF THE CU'C'I'S, OR MOUNTAINEERS OF TIPRA.

Communicated in Perſian by JOHN RAWLINS, *Eſq.*

THE inhabitants of the mountainous diſtricts to the eaſt of *Bengal* give the name of PA'TYA'N to the Being, who created the Univerſe; but they believe that a Deity exiſts in every Tree, that the Sun and Moon are Gods, and that, whenever they worſhip thoſe ſubordinate divinities, PA'TIYA'N is pleaſed.

If any one among them put another to death, the Chief of the Tribe, or other perſons

perſons, who bear no relation to the deceaſed, have no concern in puniſhing the murderer; but, if the murdered perſon have a brother, or other heir, he may take blood for blood; nor has any man whatever a right to prevent or oppoſe ſuch retaliation.

When a man is detected in the commiſſion of theft or other atrocious offence, the chieftain cauſes a recompenſe to be given to the complainant, and reconciles both parties; but the Chief himſelf receives a cuſtomary fine; and each party gives a feaſt of pork, or other meat, to the people of his reſpective tribe.

In ancient times it was not a cuſtom among them to cut off the heads of the women, whom they found in the habitations of their enemies; but it happened once, that a woman aſked another, why ſhe came ſo late to her buſineſs of ſowing grain: ſhe anſwered, that her huſband was gone to battle, and that the neceſſity of preparing food and other things for him had occaſioned her delay. This anſwer was overheard by a man at enmity with her huſband; and he was filled with reſentment againſt her, conſidering, that, as ſhe had prepared food for her huſband for the purpoſe of ſending him to battle againſt his tribe, ſo in general, if women were not to remain at home, their huſbands could not be ſupplied with proviſion, and conſequently could not make war with advantage. From that time it became a conſtant practice, to cut off the heads of the enemy's women; eſpecially, if they happen to be pregnant, and therefore confined to their houſes; and this barbarity is carried ſo far, that if a *Cúcì* aſſail the houſe of an enemy, and kill a woman with child, ſo that he may bring two heads, he acquires honour and celebrity in his tribe, as the deſtroyer of two foes at once.

As to the marriages of this wild nation; when a rich man has made a contract of marriage, he gives four or five head of *gayáls* (the cattle of the mountains) to the father and mother of the bride, whom he carries to his own houſe: her parents then kill the *gayáls*, and, having prepared fermented liquors and boiled rice with other eatables, invite the father, mother, brethren, and kindred of the bridegroom to a nuptial entertainment. When a man of ſmall property is inclined to marry, and a mutual agreement is made, a ſimilar method is followed in a lower degree; and a man may marry any woman, except his own mother. If a married couple live cordially together, and have a ſon, the wife is fixed and irremovable; but, if they have no ſon, and eſpecially if they live together on bad terms, the huſband may divorce his wife, and marry another woman.

They have no idea of heaven or hell, the reward of good, or the puniſhment of bad actions; but they profeſs a belief, that, when a perſon dies, a certain ſpirit comes and ſeizes his ſoul, which he carries away; and that, whatever the ſpirit promiſes to give at the inſtant when the body dies, will be found and enjoyed by the dead; but that, if any one ſhould take up the corſe and carry it off, he would not find the treaſure.

The food of this people conſiſts of elephants, hogs, deer, and other animals; of which if they find the carcaſſes or limbs in the foreſts, they dry them and eat them occaſionally.

When they have reſolved on war, they ſend ſpies, before hoſtilities are begun, to learn the ſtations and ſtrength of the enemy, and the condition of the roads; after which they march in the night; and two or three hours before daylight, make a ſudden aſſault with ſwords, lances, and arrows: if their enemies are compelled to abandon their ſtation, the aſſailants inſtantly put to death all the males and females, who are left behind, and ſtrip the houſes of all their furniture; but, ſhould their adverſaries, having gained intelligence of the intended aſſault, be reſolute enough to meet them in battle, and ſhould they find themſelves overmatched, they ſpeedily retreat and quietly return to their own habitations. If at any time they ſee a ſtar very near the moon, they ſay, 'to-night we ſhall undoubtedly be attacked by ſome 'enemy;' and they paſs that night under arms with extreme vigilance. They often lie in ambuſh in a foreſt near the path, where their foes are uſed to paſs and repaſs, waiting for the enemy with different ſorts of weapons, and killing every man or woman, who happens to paſs by: in this ſituation, if a leech, or a worm, or a ſnake ſhould bite one of them, he bears the pain in perfect ſilence; and whoever can bring home the head of an enemy, which he has cut off, is ſure to be diſtinguiſhed and exalted in his nation. When two hoſtile tribes appear to have equal force in battle, and neither has hopes of putting the other to flight, they make a ſignal of pacifick intentions, and, ſending agents reciprocally, ſoon conclude a treaty; after which they kill ſeveral head of *gayáls*, and feaſt on their fleſh, calling on the Sun and Moon to bear witneſs of the pacification: but if one ſide, unable to reſiſt the enemy, be thrown into diſorder, the vanquiſhed tribe is conſidered as tributary to the victors; who every year receive from them a certain number of *gaydls*, wooden diſhes, weapons, and other acknowledgements of vaſſalage. Before they go to battle they put a quantity of roaſted *álu's* (eſculent roots like

potatoes)

potatoes) and paſte of rice-flour into the hollow of bambu's, and add to them a proviſion of dry rice with ſome leathern bags' full of liquor: then they aſſemble, and march with ſuch celerity, that in one day they perform a journey ordinarily made by letter-carriers in three or four days, ſince they have not the trouble and delay of dreſſing victuals. When they reach the place to be attacked, they ſurround it in the night, and, at early dawn, enter it, putting to death both young and old, women and children; except ſuch as they chuſe to bring away captive: they put the heads, which they cut off, into leathern bags; and, if the blood of their enemies be on their hands, they take care not to waſh it off. When, after this ſlaughter, they take their own food, they thruſt a part of what they eat into the mouths of the heads, which they have brought away, ſaying to each of them: 'Eat; quench thy 'thirſt; and ſatisfy thy appetite: as thou haſt been ſlain by my hand, ſo may thy 'kinſmen be ſlain by my kinſmen!' During their journey, they have uſually two ſuch meals; and every watch, or two watches, they ſend intelligence of their proceedings to their families: when any one of them ſends word, that he has cut off the head of an enemy, the people of his family, whatever be their age or ſex, expreſs great delight, making caps and ornaments of red and black ropes; then filling ſome large veſſels with fermented liquors, and decking themſelves with all the trinkets they poſſeſs, they go forth to meet the conqueror blowing large ſhells, and ſtriking plates of metal, with other rude inſtruments of muſick. When both parties are met they ſhow extravagant joy, men and women dancing and ſinging together; and, if a married man has brought an enemy's head, his wife wears a head-dreſs with gay ornaments, the huſband and wife alternately pour fermented liquor into each other's mouths, and ſhe waſhes his bloody hands with the ſame liquor, which they are drinking: thus they go revelling, with exceſſive merriment, to their place of abode; and, having piled up the heads of their enemies in the court-yard of their chieftain's houſe, they ſing and dance round the pile; after which they kill ſome *gayáls* and hogs with their ſpears, and, having boiled the fleſh, make a feaſt on it, and drink the fermented liquor. The richer men of this race faſten the heads of their foes on a bambu, and fix it on the graves of their parents; by which act they acquire great reputation. He, who brings back the head of a ſlaughtered enemy, receives preſents from the wealthy of cattle and ſpirituous liquor; and, if any captives are brought alive, it is the prerogative of thoſe chieftains, who were not in the campaign, to ſtrike off the heads of the captives. Their weapons are made by

by particular tribes; for ſome of them are unable to fabricate inſtruments of war.

In regard to their civil inſtitutions; the whole management of their houſehold affairs belongs to their women; while the men are employed in clearing foreſts, building huts, cultivating land, making war, or hunting game and wild beaſts. Five days (they never reckon by months or years) after the birth of a male child, and three days after that of a female, they entertain their family and kinſmen with boiled rice and fermented liquor; and the parents of the child partake of the feaſt. They begin the ceremony with fixing a pole in the court yard; and, then, killing a *gayál* or a hog with a lance, they conſecrate it to their deity; after which all the party eat the fleſh and drink liquor, cloſing the day with a dance and with ſongs. If any one among them be ſo deformed, by nature or by accident, as to be unfit for the propagation of his ſpecies, he gives up all thought of keeping houſe, and begs for his ſubſiſtence, like a religious mendicant, from door to door, continually dancing and ſinging. When ſuch a perſon goes to the houſe of a rich and liberal man, the owner of the houſe uſually ſtrings together a number of red and white ſtones, and fixes one end of the ſtring on a long cane, ſo that the other end may hang down to the ground; then, paying a kind of ſuperſtitious homage to the pebbles, he gives alms to the beggar; after which he kills a *gayál* and a hog, and ſome other quadrupeds, and invites his tribe to a feaſt: the giver of ſuch an entertainment acquires extraordinary fame in the nation; and all unite in applauding him with every token of honour and reverence.

When a *Cúcì* dies, all his kinſmen join in killing a hog and a *gayál*; and, having boiled the meat, pour ſome liquor into the mouth of the deceaſed, round whoſe body they twiſt a piece of cloth by way of ſhroud: all of them taſte the ſame liquor as an offering to his ſoul; and this ceremony they repeat at intervals for ſeveral days. Then they lay the body on a ſtage, and, kindling a fire under it, pierce it with a ſpit and dry it: when it is perfectly dried, they cover it with two or three folds of cloth; and, encloſing it in a little caſe within a cheſt, bury it under ground. All the fruits and flowers, that they gather within a year after the burial, they ſcatter on the grave of the deceaſed: but ſome bury their dead in a different manner; covering them firſt with a ſhroud, then with a mat of woven reeds, and hanging them on a high tree. Some when the fleſh is decayed, waſh the bones, and keep them dry in a bowl, which they open on every ſudden emergence; and, fancying

fancying themſelves at a conſultation with the bones, purſue whatever meaſures they think proper; alleging, that they act by the command of their departed parents and kinſmen. A widow is obliged to remain a whole year near the grave of her huſband; where her family bring her food: if ſhe die within the year, they mourn for her; if ſhe live, they carry her back to her houſe, where all her relations are entertained with the uſual feaſt of the *Cúcì's*.

If the deceaſed leave three ſons, the eldeſt and the youngeſt ſhare all his property; but the middle ſon takes nothing: if he have no ſons, his eſtate goes to his brothers, and, if he have no brothers, it eſcheats to the chief of the tribe.

NOTE.

A party of *Cúcì's* viſited the late CHARLES CROFTES, Eſq. at *Jáfarabád* in the ſpring of 1776, and entertained him with a dance: they promiſed to return after their harveſt, and ſeemed much pleaſed with their reception.

XIII.

ON THE SECOND CLASSICAL BOOK OF THE CHINESE. *See the Works of Sir William Jones, Vol. I. p.* 365.

A LETTER TO THE PRESIDENT FROM A YOUNG CHINESE.

SIR,

I RECEIVED the favour of your letter dated the 28th March, 1784, by Mr. *Cox*. I remember the pleaſure of dining with you in company with Captain *Blake* and Sir *Joſhua Reynolds*; and I ſhall always remember the kindneſs of my friends in *England*.

The

The *Chineſe* book, *Shi King*, that contains three hundred poems, with remarks thereon, and the work of *Con-fu-tſu*, and his grandſon, the *Tai Ho*, I beg you will accept: but to tranſlate the work into *Engliſh* will require a great deal of time, perhaps three or four years; and I am ſo much engaged in buſineſs, that I hope you will excuſe my not undertaking it.

If you wiſh for any books or other things from *Canton*, be ſo good as to let me know, and I will take particular care to obey your orders.

Wiſhing you health,

I am, Sir,

Your moſt obedient humble Servant,

WHANG ATONG.

A TABLE

XIV.

A TABLE,

Containing Examples *of all the different species of* Infinitives *and* Participles *that are derived from* Triliteral Verbs, *in the form in which they are used in the* Persian, *and in the Language of* Hindostan.

Arabic Triliteral Verbs

			Conjugation 1st Form		2d Form		3d Form		4th Form	
I. With three different radicals, none of them اوي, as فعل		Infin.	فعل action,	فعل	تقصير fault,	قصر	مخالفت opposition,	خلف	اظهار demonstration,	ظهر
		Part. act.	حاكم judging,	حكم	مصدّع importuning,	صدع	مطابق conforming,	طبق	مهلك destroying,	هلك
		Part. pass.	مقتول slain,	قتل	مكسّر broken,	كسر	مناسب connected,	نسب	مطلق absolved,	طلق
II. With the 2d and 3d radicals the same, but none of them اوي, as عزّ		Infin.	[illegible] honour,	عزّ	تكرار repetition,	كرّ	امتداد extension,	مدّ	اقرار confirmation,	قرّ
		Part. act.	حاجّ performing the pilgrimage,	حجّ	محقّق certifying,	حقّ	ممتدّ extending,	مدّ	معزّ honouring,	عزّ
		Part. pass.	مذموم blamed,	ذمّ	مكرّر repeated,	كرّ	مضادّ opposed,	ضدّ	معدّ prepared,	عدّ
III. With ا for the 1st radical, as ادب		Infin.	[illegible] civility,	ادب	تأديب instruction,	ادب	مؤاخرت procrastination,	اخر	ايثار presentment,	اثر
		Part. act.	[illegible]	امل	موصّل establishing,	اصل	موارف lying contiguous,	ارف	موكّل giving to eat,	اكل
		Part. pass.	مأخوذ taken,	اخذ	مؤدّب well educated,	ادب	مؤانس familiarized,	انس	مؤلم pained,	الم
IV. With ا for the 2d radical, as سأل		Infin.	[illegible] petition,	[illegible]	[illegible] mitigation,	[illegible]	ملايمت complacency,	لأم	اسالت compliance,	سال
		Part. act.	[illegible]	[illegible]						
		Part. pass.	مسؤل sought,	[illegible]	[illegible] clothed in mail,	لأم			[illegible] filled,	ملأ
V. With ا for the 3d radical, as برأ		Infin.	[illegible] relief, cure,	برأ	[illegible] congratulation,	هنأ			[illegible] relief,	برأ
		Part. act.	[illegible] creating,	[illegible]	[illegible] free,	برأ			مبنى causing to build,	بنا
		Part. pass.	[illegible] freed,	[illegible]	[illegible] congratulated,	هنأ			منشا erected,	نشا
VI. With و for the 1st radical, as وضع		Infin.	[illegible]	[illegible]	[illegible] concurrence,	وفق	مواظبت perseverance,	وظب	ايجاب necessity,	وجب
		Part. act.	[illegible]	[illegible]	[illegible] confirming,	[illegible]	موافق agreeing,	وفق	موجب causing,	وجب
		Part. pass.	[illegible]	[illegible]	[illegible] assisted,	وثق			موجّد confirmed,	وجد
VII. With و for the 2d radical, as قول		Infin.	[illegible] speech,	[illegible]	[illegible] prolixity,	طول	مداومت continuation,	دوم	اجازت permission,	جوز
		Part. act.	[illegible] speaking,	[illegible]	[illegible] illuminating,	نور	مقاومت rising against another,	قوم	مقيم continuing,	قوم
		Part. pass.	[illegible] spread,	[illegible]	[illegible] extended,	طول			مجاز permitted,	جوز
VIII. With و for the 3d radical, as [illegible]		Infin.	[illegible] invitation,	[illegible]	[illegible] education,	[illegible]	ملاقات interview,	لقو	انشا composition,	نشو
		Part. act.	[illegible] transgressing,	[illegible]	[illegible]	[illegible]	ملاقي meeting,	لقو	منشي a Munshy, [illegible]	نشو
		Part. pass.	[illegible]	[illegible]	[illegible] instructed,	[illegible]			ملقا thrown,	لقو
IX. With ي for the 1st radical, as يمن		Infin.	[illegible] certainty,	[illegible]	تيسير the act of [illegible],	يسر	[illegible] the act of [illegible],	[illegible]	ايقان certain knowledge,	يقن
		Part. act.	[illegible] prospering,	[illegible]	[illegible] prosperity,	[illegible]			موقن certain,	يقن
		Part. pass.	[illegible] favoured by fortune,	يمن	[illegible] obtained,	يسر				
X. With ي for the 2d radical, as [illegible]		Infin.	[illegible] the act of walking out,	سير	تغيير alteration,	غير	مغايرت the act of changing,	غير	اضافت relation,	ضيف
		Part. act.	[illegible] inclining,	[illegible]	[illegible]	[illegible]	مغاير opposing,	غير	مخيّم pitching a tent,	خيم
		Part. pass.	[illegible] sold,	[illegible]	[illegible] changed,	[illegible]			مضاف annexed,	ضيف
XI. With ي for the 3d radical, as [illegible]		Infin.	[illegible] injustice,	[illegible]	[illegible] the act of [illegible],	[illegible]	مكافات compensation,	كفي	انها the act of announcing,	نهي
		Part. act.	[illegible] judging,	[illegible]	مصلّي praying,	صلي	منافي repugnant,	نفي	منهي reporting,	نهي
		Part. pass.	[illegible] determined,	قضي	مثنّا doubled,	ثني			مغشّا covered over,	غشي
XII. With ا for the 1st and [illegible] for the 3d radical, as [illegible]		Infin.	[illegible] arrival,	[illegible]	تأويل explication,	اول				
		Part. act.	[illegible]	[illegible]	مؤوّل explaining,	اول				
		Part. pass.	[illegible] hurt,	[illegible]	مؤوّل translated,	اول			مودي weighed down,	اود

A TABLE containing EXAMPLES, &c.

5th. Form		6th. Form		7th. Form		8th. Form		10th. Form	
تَكَبُّر arrogance,	كبر	تَغَافُل negligence,	غفل	اِنْكِسَار contrition,	كسر	[illegible] revelation,	نظر	اِسْتِقْبَال a meeting,	قبل
مُتَصَرِّف possessing,	صرف	مُتَعَاقِب succeeding another,	عقب	[illegible] comprehending & comprehended,	درج	[illegible] expecting,	نظر	مُسْتَحْفِظ protecting,	حفظ
مُتَعَلِّق annexed,	علق	مُتَبَاعِد removed,	بعد			[illegible] regulated,	نظم	مُسْتَحْكِم confirmed,	حكم
تَجَسُّس investigation,	جسّ	تَدَاعُب mutual search,	[illegible]	اِنْحِلَال solution,	حلّ	[illegible] fortitude,	[illegible]	اِسْتِقْلَال independence,	قلّ
[illegible] opposing,	رقّ	[illegible] disputation,	[illegible]	[illegible] flowing profusely,	[illegible]	[illegible] wearing out,	شدّ	[illegible] absolute,	قلّ
مُتَضَرِّر injured,	ضرّ	مُتَرَاقّ opposing each other,	[illegible]			[illegible] deprived,	حلّ	مُسْتَمِرّ path,	مرّ
تَأَمُّل deliberation,	أمل	مُتَمَاسّ touched,	[illegible]			[illegible] confidence,	أمن	اِسْتِئْصَال extirpation,	أصل
مُتَأَخِّر retarding,	أخر					[illegible] confiding,	[illegible]	مُسْتَأْدِب studying civility,	أدب
	قال					[illegible] confided,	أمن	مُسْتَأْصَل eradicated,	أصل
						[illegible] auguration,	فأل		
تَسَؤُّل the act of begging,	سأل	تَسَاؤُل expostulation,	سأل						
مُتَسَوِّل or مُتَسَائِل begging,	سأل	مُتَسَائِل begging,	سأل						
		مُتَفَائِل portended,	فأل						
[illegible] refreshing with good food,	[illegible]					[illegible]		[illegible] purification,	برأ
مُتَبَرِّي freeing,	برأ	مُتَبَاهِي boasting mutually,	[illegible]			[illegible] beginning,	[illegible]	مُسْتَبْرِي desiring to be free,	برأ
مُتَهَنَّأ congratulated,	هنأ					[illegible]	[illegible]		
تَوَقُّف delay,	وقف	تَوَاضُع submission,	[illegible]			[illegible]	[illegible]	اِسْتِيطَان residence,	وطن
[illegible] strong connexion,	[illegible]	مُتَوَالِي succeeding another,	[illegible]			[illegible] approaching,	[illegible]	مُسْتَوْطِن residing,	وطن
[illegible] expected,	وقع	مُتَوَاصِل united,	[illegible]			[illegible] united,	[illegible]	مُسْتَوْدَع deposited,	ودع
[illegible] the act of imagining,	[illegible]	[illegible] excess,	[illegible]	اِنْقِيَاد submission,	قود	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] imagining,	صور	مُتَجَاوِز exceeding,	جوز	[illegible] obeying,	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] imagined,	صور	[illegible] received in loan,	[illegible]			[illegible]	[illegible]	[illegible] received in loan,	[illegible]
تَعَدِّي violence,	عدو	[illegible] profession,	[illegible]	اِنْجِلَاء brightness,	[illegible]	[illegible] conference,	[illegible]	[illegible] the act of persuading,	[illegible]
مُتَعَدِّي transgressing,	عدو	مُتَعَالِي rising on high,	علو	[illegible] contagious,	[illegible]	[illegible] coming to meet,	[illegible]	مُسْتَعْدِي desiring aid to oppose,	عدو
[illegible] met,	لقو					[illegible] afflicted,	[illegible]	[illegible] solicited,	[illegible]
[illegible] the act of making happy,	[illegible]	[illegible] the act of revolting,	[illegible]			[illegible] the act of affecting,	[illegible]	[illegible] the act of facilitating,	[illegible]
مُتَيَقِّن ascertaining,	يقن	[illegible] revolting,	[illegible]					[illegible] exploring,	[illegible]
[illegible] roused,	[illegible]	[illegible] revolted,	[illegible]						
[illegible] application,	[illegible]	[illegible] collusion,	[illegible]			[illegible] option,	[illegible]	[illegible] the act of soothing,	[illegible]
[illegible] wondering,	[illegible]	[illegible] altering,	[illegible]	[illegible] submission,	[illegible]	[illegible] choosing,	[illegible]	[illegible] acquiring gain,	[illegible]
[illegible] appointed,	[illegible]			[illegible]	[illegible]	[illegible] chosen,	[illegible]	[illegible] increased,	[illegible]
تَعَصِّي rebellion,	عصى	[illegible] exaltation,	[illegible]	[illegible] expiration of time,	[illegible]	[illegible] fulfilment,	[illegible]	[illegible] appeal for judgement,	[illegible]
[illegible] wishing,	[illegible]	[illegible] completing,	[illegible]	[illegible] coming to a conclusion,	[illegible]	[illegible] acquiring,	[illegible]	مُسْتَغْنِي enjoying plenty,	غني
[illegible] wished,	[illegible]					[illegible] acquired,	[illegible]	مُسْتَثْنَا excepted,	ثني
[illegible] exposition,	[illegible]								
[illegible] interpreting,	[illegible]					[illegible] affirming,	[illegible]	مُسْتَأْوِز taking flight,	[illegible]
[illegible] translated,	[illegible]					[illegible] returned,	[illegible]	مُسْتَأْوِز affrighted,	[illegible]

No.		Root	Form	Conjugation 1st.	from	2d.	from	3d.	from	4th.	from
XIII.	With ا for the 1st, and ي the 2d radical, as	ايد	Infin.	ايد strength,		تأييد confirmation,	ايد				
			Part. act.	ايد potent,	ايد	مؤيد confirming,	ايد			مؤيد confirming,	ايد
			Part. pas.	مايوس made desperate,	ايس	مؤيد confirmed	ايد			مؤيد confirmed,	ايد
XIV.	With ا the 2d, and و the 3d radical, as	سوء	Infin.	سوء depravity,		[illegible] accusation,	سوء	[illegible] evil,	سوء	اساءة evil doing,	سوء
			Part. act.							مسيء finning,	سوء
			Part. pas.								
XV.	With ا the 2d, and ي the 3d radical, as	جاي	Infin.	[illegible] the act of calling to eat and drink,		[illegible] [illegible]ation,	[illegible]				
			Part. act.	جاي coming,		[illegible] preparing,	[illegible]				
			Part. pas.			[illegible] prepared,	[illegible]				
XVI.	With ا the 1st, and و the 3d radical, as	اخو	Infin.	[illegible] brotherhood,		[illegible] the act of calling father,	ابو	مؤاخاة the cultivation of friendship,	اخو		
			Part. act.	آسي [illegible],		[illegible] giving comfort,	اسو			[illegible] giving comfort,	اسو
			Part. pas.	[illegible] cured,							
XVII.	[illegible] 3d radical,	اذي	Infin.	اذي trouble,		[illegible] [illegible],	اذي	مؤاذات parallelism,	اذي	ايذا molestation,	اذي
			Part. act.	آذي taking trouble,	[illegible]	[illegible] [illegible]ing,	اذي	[illegible] parallel,	اذي	[illegible] molesting,	اذي
			Part. pas.			[illegible] performed,	اذي				
XVIII.	With ا the 2d, and ي the 3d radical, as	راي	Infin.	[illegible] observation,	راي			مراءات dissimulation,	راي	[illegible] the act of shewing,	راي
			Part. act.	رائي observing,				[illegible] dissimulating,	راي		
			Part. pas.	مرئي observed,							
XIX.	With و the 1st, and ي the 3d radical, as	وقي	Infin.	وقي protection,		[illegible] the act of pro[illegible]ing,	[illegible]	موافات the performance of what is due,	وفي	ايصا the performance of what is stipulated,	وصي
			Part. act.	واقي protecting,		[illegible] [illegible]erful,	[illegible]	موافي performing,	وفي	موصي making a will,	وصي
			Part. pas.	موقي protected,		[illegible] [illegible]efited by a will,	[illegible]			موصى performed,	وصي
XX.	With ي the 1st, and ي the 3d radical,	يدي	Infin.	يدي power,				مياداة payment out of one's own hand,	يدي		
			Part. act.							مؤدي beneficent,	يدي
			Part. pas.	ميدي hurt in the hand,	[illegible]					مودى benefited,	يدي
XXI.	With و the 2d, and ي the 3d radical,	قوي	Infin.	قوت strength,	[illegible]	تقوية corroboration,	قوي	مساوات the act of making equal,	سوي		
			Part. act.	ثاوي seizing,	[illegible]	[illegible] strengthening,	قوي	مساوي equal,	سوي	مقوي having strong cattle,	قوي
			Part. pas.	مروي narrated,	روي	مقوا strengthened,	قوي				
XXII.	With ي the 2d and ي the 3d radical, as	حيي	Infin.	حياة life,	حي	[illegible] [illegible]lution,	حيي			احيا vivification,	حيي
			Part. act.	حاي living,	[illegible]	محيي fainting,	[illegible]			محيي vivifying,	حيي
			Part. pas.								
XXIII.	With ا for the 1st, and ي the 2d radical,	اوي	Infin.	اوي [illegible],							
			Part. act.	آوي [illegible] gol,							
			Part. pas.								
XXIV.	With و the 1st, and ي the 3d radical,	واي	Infin.	واي promise,	واي						
			Part. act.								
			Part. pas.								

A TABLE CONTAINING EXAMPLES

5th. Form		6th. Form		7th. Form		8th. Form		10th. Form	
تأكد confirmation,	ايد								
تأكيد confirming,	ايد								
متأكد made sure,	ايد								
تهيؤ preparation,	هي								
متهيئ preparing,	هي								
متهيأ prepared,	هي								
تآخي behaviour of a brother,	اخو	تآخي mutual fraternity,	اخو						
متآخي acting like a brother,	اخو	متآخي behaving mutually like brothers,	اخو			مؤاخي imitating,	اسو		
تأني caution,	اني							مستأني waiting with patience,	اني
متأني cautious,	اني								
		متراءي looking at one another,	راي						
توفي the act of fulfilling,	وفي	توالي a series of succession,	ولي			توفي [illegible],	وفي	استيفاء the act of fulfilling,	وفي
متوفي giving up life,	وفي	متوالي following a succession,	ولي			متوفي [illegible],	وفي	استيفاء fulfilling,	وفي
متوفى deceased,	وفي								
تقوي superior strength,	قوي	تقاوي the act of impowering,	قوي			استوي equality,	سوي		
متقوي having great strength,	قوي	متقاوي impowering,	قوي			مستوي equal,	سوي		
								استحياء modesty,	حيي
متآوي collecting together,	اوي					مؤاوي receiving into his house,	اوي		

ADVERTISEMENT.

EXAMPLES of derivatives from Arabick Quadriliterals rarely occur in the Perſian language; and from the 9th, 11th, 12th, and 13th Conjugations of Triliterals there are none to be met with. I have therefore confined my obſervations to the nine Conjugations included in the Table. And although particular ſenſes and uſes are aſſigned to each of theſe by Grammarians (which may be ſeen in Mr. Richardſon's Gram. p. 65), it is at the ſame time to be obſerved, that they are nevertheleſs frequently uſed in other ſenſes; many of them retaining the ſimple ſignification of their primitives: and that every root does not extend through every Conjugation; but that ſome are uſed in one form; many in ſeveral; none in all.

Theſe obſervations are applicable to the preſent ſubject; and the derivatives of ſuch conjugations as are more frequently uſed in the Arabick ſeem alſo to be more frequently than any other introduced into the Perſian.

Where no example of any particular form is to be found in Golius and Meninſki I have left a blank in the Table, which may be filled up whenever any can be met with.

With regard to the examples which I have brought to illuſtrate the following Rules, they are ſuch as came firſt to hand; and *one* example of an Infinitive or Participle is intended as a repreſentation of the Infinitives and Participles of every ſpecies and conjugation. To have attempted a complete ſyſtem of examples would have carried me far beyond the limits of my preſent undertaking.

Of ARABICK INFINITIVES.

I. Their Maſculine Singulars are uſed in the Perſian as Subſtantives; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1. governing a ſub. fol. اظهار یکانکی demonſtrations of unanimity.

2. agreeing with an ad. fol. استعجال تمام great haſte.

3. agreeing with a part. paſ. fol. تحریر مسطور the ſaid writing.

4. nominatives to verbs, نظر براین بود my view was this.

5. governed

Ex. 5. governed by verbs, احتظاظِ وافر یافت he received great delight.
6. governed by a prepoſition, بعد از تقدیم مراسم after performing the duties.
7. united by a conjunction, اقبال و اجلال proſperity and ſplendor.
8. rendered definite by affixing ي اتّحادي که در میان بود the union that was, between.

II. Their Maſculine Plurals are uſed in the Perſian as Subſtantives; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1. governing a ſub. ſol. اخلاقِ مردم the diſpoſitions of men.
2. agreeing with an ad. ſol. افعالِ نیک good actions.
3. agreeing with a part. paſ. ſol. اطوارِ مسطور the qualifications deſcribed.

III. Their Feminine Singulars are uſed in the Perſian as Subſtantives; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1. nominatives to verbs, اجازت است there is permiſſion.
2. governing a ſub. ſol. معاملتِ ملک the buſineſs of the empire.
3. agreeing with an ad. ſol. مقاتلهٔ عظیمه a bloody battle.
4. agreeing with a part. paſ. ſol. مکاتبهٔ مرقومه بدوستي a letter written in friendſhip.

IV. Their Feminine Plurals are uſed in the Perſian as Subſtantives; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1. governing a ſub. ſol. توجهاتِ دوستان the civilities of friends.
2. agreeing with an ad. ſol. معاملاتِ کلّي public affairs.
3. agreeing with a part. paſ. ſol. تکلیفاتِ مزبور the ſaid burthens.

V. The

V. The Infinitives of the firſt Conjugation of Tranſitive Verbs are regularly of the form exhibited in the Table. But thoſe of Intranſitives are reducible to no proper rule without innumerable exceptions. Grammarians make of them in all thirty-two different forms, which may be ſeen in Mr. Richardſon's Grammar, p. 92: but for theſe irregularities he juſtly obſerves that a dictionary is the only proper guide. Theſe Infinitives, both Singulars and Plurals, are introduced freely into the Perſian as Subſtantives.

Ex. governing another ſub. fol. وصولِ مکتوب the arrival of the letter, &c. &c.

OF ARABICK PARTICIPLES ACTIVE.

I. Their Maſculine Singulars are uſed in the Perſian as Participles, as Subſtantives, and as Adjectives.

Ex. 1. as participles with a verb fol. منتظر ماند he remained expecting.

طالع و لامع باد be ſhining and blazing.

2. as ſub. governing another ſub. fol. حاکمِ شهر governor of the city.

موجبِ خوشنودي causing gladneſs—the cauſe of gladneſs.

مصنّفِ این کتاب compoſing this book—the author of this book.

مطابقِ شرعِ شریف following the noble law—follower of the noble law.

3. as an ad. qualifying a ſub. مردمِ قابل an able man.

4. following another ſub. ſignifying the ſame thing حضرتِ خالق God the creator.

5. agreeing with an ad. fol. عاملِ نیک a good agent.

6. agreeing with a part. paſ. fol. حاکمِ مستقلّ abſolute judge.

7. governed by a verb, قاتلرا کشت he put the murderer to death.

8. nominatives to verbs, اگر عاشقِ صادق است if the lover be ſincere.

Ex. 9. with a prepoſn. fol. an uncommon conſtruction, مشتمل بر مصادقت containing friendſhip.

II. Their Maſculine perfect Plurals are uſed in the Perſian as Subſtantives, in the form of the oblique caſe which terminates in ين. But they do not ſeem to be uſed in the form of the nominative which terminates in ون.

Ex. 1. governed by a ſub. going before, علمِ اوّلين وآخرين the knowledge of the moderns and ancients.

قومِ مسلمين the ſect of the faithful.

III. Their Maſculine imperfect Plurals are uſed in the Perſian as Subſtantives.

Ex. 1. governing a ſub. fol. حكّامِ حال و استقبال officers of the preſent and future.

2. agreeing with an ad. fol. عمالِ جديد و قديم the new and old agents.

IV. Their Feminine Singulars are uſed in the Perſian as Participles, as Subſtantives, and as Adjectives.

Ex. 1. as a part. act. with a verb fol. حامله است ſhe is pregnant.

2. as a ſub. governing another fol. مالكهٔ ملک queen of the empire.

3. as an ad. qualifying a ſub. going before زنِ حامله a pregnant woman.

4. as a ſub. qualified by an ad. following, مشفقهٔ مهربان kind friend.

5. as a ſub. qualified by a part. paſ. following, صاحبهٔ موصوفه accompliſhed lady.

V. Their Feminine perfect Plurals are uſed in the Perſian as Subſtantives expreſſing things without life.

Ex. 1. governing a ſub. fol. واقعاتِ زمان the incidents of time.

2. agreeing with an ad. fol. واردات ناگهاني unforeſeen events.

OF

OF ARABICK PARTICIPLES PASSIVE.

I. Their Maſculine Singulars are uſed in the Perſian as Participles Paſſive, as Subſtantives, and as Adjectives.

Ex. 1. as a part. paſ. جملگي هيبت مصروف بران است the ſum of my deſire is beſtowed on that.

ظلِّ شفقت مبد و دباد be the ſhade of clemency extended.

2. as a ſub. governing another fol. it, مشهودِ ضمير منير ميكر داند I make it the perception (i. e. the thing perceived) of your enlightened ſoul; i. e. I repreſent it, &c.

مرغوبِ طبايع the deſire (i. e. the thing deſired) of the ſouls.

3. as an ad. qualifying a ſub. going before, بندهٔ مظلوم the injured ſlave.

4. joined with another ſub. by a conjunction, مقصود ومرام intention and deſign.

5. governed by verbs, خلايق را محظوظ كردانند make the people glad.

6. nominatives to verbs, مقصودِ اوشان بر اين بود their intention was this.

II. Their Maſculine perfect Plural, does not ſeem to be uſed in the Perſian, either in the form of the nominative or the oblique caſe.

III. Their Feminine Singulars are uſed in the Perſian as Subſtantives, and as Adjectives.

Ex. 1. as a ſub. governing another fol. it, معشوقهٔ من my beloved, i. e. the beloved of me.

2. as a ſub. agreeing with a part. paſ. following, معشوقهٔ مذكوره the ſaid beloved woman.

3. as an ad. agreeing with a ſub. going before, والدهٔ مخدومه reſpected mother.

IV.

IV. Their Feminine perfect Plurals are uſed in the Perſian as Subſtantives, to expreſs things without life.

Ex. 1. governing a ſub. fol. مطلوباتِ آن مهربان the demands of that friend.
2. agreeing with an ad. fol. مقدماتِ شرعي law affairs.

V. The Active and Paſſive Participles of Tranſitive verbs form, with a following ſubſtantive having the Article ال prefixed to it, compounds correſponding to that of خوب‌روي, which are uſed in the Perſian as Subſtantives, and as Adjectives.

Ex. 1. as a ſub. a nominative to the verb, متعذّرُ الفصل است he evades a deciſion.
2. as an ad. qualifying a ſub. شخصِ واجبُ التعظيم a perſon deſerving reſpect.
قلمِ مقطوعُ اللسان a pen cut ſhort in the point.

OF ARABICK ADJECTIVES RESEMBLING PARTICIPLES.

I. The forms حَسَنْ صَعْبْ سَرِيرْ repreſent three ſpecies of Arabick words which are derived from Intranſitive verbs; and called by Arabick Grammarians, Adjectives reſembling Participles. The Singulars of theſe forms are uſed in the Perſian both as Adjectives and Subſtantives.

Ex. 1. as a ſub. qualified by the pronoun dem. آن عزيزْ that reſpectable perſon.
2. with a verb, شريراست he is wicked.
3. as an ad. qualifying a ſub. دوست قديم an old friend.

II. Their Plurals are uſed in the Perſian as Subſtantives.

Ex. 1. governing a ſub. fol. حكماءِ يونان the learned men of Greece.
2. agreeing with an ad. fol. شرفاءِ پاك‌نهاد noblemen of integrity.

III.

III. Theſe three forms of Adjectives reſembling Participles, form, with a following Subſtantive having the Article ال prefixed to it, compounds correſponding to that of خوب‌روي, which are uſed in the Perſian both as Subſtantives and Adjectives.

Ex. 1. as a ſub. qualified by the pro. demonſt. آن حسنُ الوجه that beauty.
آن قديمُ الخدمت that old ſervant.

2. as a ſub. qualified by an ad. fol. قديم الخدمتِ مذكور the ſaid old ſervant.

3. as an ad. qualifying a ſub. going before, مردِ قديم الخدمت a man of long ſervice.

OF PARTICIPLES EXPRESSING THE SENSE OF THEIR PRIMITIVES IN A STRONGER DEGREE.

I. The forms نَصِيرٌ نَصَّارٌ نَصُورٌ نَصْرٌ مِنْصَارٌ are Participles which expreſs the ſenſe of their primitives in a ſtronger degree; and are ſometimes uſed in the Perſian as Adjectives.

Ex. 1. agreeing with a ſub. going before, ادويهٔ قتّاله a poiſonous medicine.

2. agreeing with a verb. fol. صبور است he is full of patience.

صريب Is the form of a Participle expreſſing the ſenſe of the primitive in a leſs degree; but it does not ſeem to be uſed in the Perſian.

OF ARABICK SUBSTANTIVES.

I. The Arabick Noun of time and place are frequently employed in the Perſian; and the following liſt exhibits the forms of ſuch as are derived from the firſt Conjugations of the different ſpecies of Triliterals.

CONJUGATION 1ſt.

NOUNS OF TIME AND PLACE FROM TRILITERALS.

	FROM		Roots.
I.	مَكْتَبْ	the time and place of writing,	كتب
II.	مَقَرّ	a place of reſt, reſidence,	قرّ
III.	مَا مَنْ	a place of ſafety,	امن
V.	مبْدَا	the place and time of beginning,	بداء
VI.	مَوْضِعْ	place, opportunity,	وضع
VII.	مَقَام	the place and time of ſtanding,	قوم
VIII.	مَدْعَا	the place or object of deſire,	دعو
X.	مَبْيِعْ	the place and time of ſelling,	بيع
XI.	مَرْمَا	the place and time of throwing,	رمي
XII.	مَآبْ	the place of return, the center,	اوب
XV.	مَجِيْ	the time of coming—arrival,	جي
XVII.	مَا تَا	the place, the way of approaching,	اتي
XVIII.	مَرْءَا	the place of looking, beholding,	راي
XIX.	مَوْلَا وَمَوْلِيْ	the place of power—and thus Lord, Maſter, &c.	ولي
XXI.	مَهْوَا	a place of diviſion—the interval,	هوي
XXII.	مَحْيَا	the time and place of living,	حي
XXIII.	مَاوَا وَمَاوِيْ	a place of habitation—refuge,	اوي

——— To expreſs the *place* more particularly, ه is ſometimes added to the common form as مقبره a burning place.

I. The

II. The Noun of time and place from the derivative Conjugations is exactly the ſame with the Participle Paſſive; and is alſo uſed in the Perſian.

Ex. 1. a part. Paſſive from the 10th conjugation, مستودع depoſited—alſo a place of depoſit.

III. The Perſian language has terms proper to itſelf for expreſſing the Inſtrument of Action; it does not however reject the uſe of the Arabick Inſtrumental Noun which is repreſented by the forms مِنْصَرٌ مِنْصَارٌ or مِنْصَرَتٌ.

Ex. 1. governing another ſub. fol. بميزانِ عقل سنجيد he weighed in ſcale of reaſon.

مفتاحِ مقصود the key of his intention.

IV. All Arabick proper names, and the names of things, are introduced into the Perſian at pleaſure.

Ex. مريم Mary, مكّه Mecca, عين the eye, لحم fleſh, جدّ an anceſtor, &c. &c.

OF ARABICK ADJECTIVES.

I. Beſides the Arabick Participles which we have already obſerved are uſed as Adjectives, there is alſo a plentiful ſource of real Adjectives formed by affixing ي to Subſtantives of almoſt every denomination, which are freely introduced into the Perſian.

Ex. انساني humane, اراضي earthly, مصري Egyptian, &c. &c.

II. The Maſculine Singulars of Arabick Superlatives are uſed in the Perſian both as Subſtantives and Adjectives.

Ex. 1. as a ſub. governing another ſol. it, اسعدِ زمان the moſt fortunate of times.

2. as an ad. qualifying a ſub. going before, دروقتِ احسن at a moſt lucky time.

III.

III. The Maſculine Plurals of Arabick Superlatives are uſed in the Perſian both as Subſtantives and Adjectives.

Ex. 1. as a ſub. governing another fol. it, اکابرِ وقت the great men of the age.

2. as an ad. qualifying a ſub. going before, اشخاصِ اکابر moſt illuſtrious perſonages.

IV. The Feminine Singulars of Arabick Superlatives are uſed in the Perſian as Adjectives.

Ex. 1. qualifying a ſub. going before, دولتِ عظمی proſperity moſt great.

V. Arabick Ordinal Numbers are uſed in the Perſian as Adjectives.

Ex. 1. qualifying a ſub. going before, بابِ اول the firſt chapter.

OF THE FORM OF ARABICK WORDS WHEN USED IN THE PERSIAN.

I. All Arabick Infinitives, Participles, Subſtantives, and Adjectives, are introduced into the Perſian in the form of the nominative, which throws away from the laſt letter every ſpecies of Nunnation (ـٌ ـٍ ـً) or ſhort vowel (ـُ ـِ ـَ), which they may poſſeſs as Arabick words, and remain without motion: but, when their conſtruction in the Perſian requires them to aſſume the termination of another caſe, they receive it in the ſame manner as if they were originally Perſian words; with the following exceptions.

1ſt. When an Arabick word terminating in ي, that muſt be pronounced as ا *, becomes the firſt Subſtantive in conſtruction with another Subſtantive following it, ي is actually changed into ا, to which ſhort ي (ـِ) is afterwards affixed, to ſhew the conſtruction.

Ex. تمنی in conſtruction becomes تمنایِ as تمنایِ شفاعت the petition of interceſſion, and ſo alſo مولیِ دعویِ مغنیِ &c.

2d. Feminine Arabick *Subſtantives* terminating in ۃ, when introduced into the Perſian, change ۃ, ſometimes into ہ, and ſometimes into ت

* See Richardſon's Arabick Gram. p. 109. Canon III.

Ex.

Ex. محبة friendſhip, being found written by the ſame author محبة and محبت

3d. Feminine Arabick *Adjectives* and *Participles* terminating in ة, when introduced into the Perſian, always change ة into ه.

Ex. خالصة pure, is always written خالصه as محبت خالصه pure friendſhip.

4th. Arabick Participles Plural, terminating in ين, although introduced into the Perſian as Nominatives, are originally the oblique caſe.

Ex. دانایان متقدمین چنین فرمودند the learned ancients thus ſaid.

5th. When an Arabick Infinitive is uſed in the Perſian language as an adverb, it is introduced in the form of the Arabick accuſative without any change.

Ex. اتفاقا accidentally, &c. &c.

OF ARABICK ADVERBS, PREPOSITIONS AND CONJUNCTIONS.

I. Arabick Adverbs, Prepoſitions, and Conjunctions ſeem to be introduced into the Perſian language at pleaſure. Of theſe Mr. Richardſon has made a very uſeful collection in his Chapter of ſeparate Particles, to which I beg leave to refer; obſerving at the ſame time, that a knowledge of ſuch, as are moſt frequently employed, will eaſily be acquired from experience without any particular inſtructions.

OF ARABICK COMPOUNDS.

I. The manner, in which different Arabick parts of ſpeech are employed to form a variety of Compounded Words made uſe of in the Perſian, is well explained by Sir William Jones in his Perſian Grammar; and with reſpect to Phraſes purely Arabick, and whole ſentences, which are often met with in Perſian Authors, they require a perfect knowledge of the Arabick language, and do not belong to this place.

OF THE CONSTRUCTION OF ARABICK INFINITIVES, PARTICIPLES, SUBSTANTIVES AND ADJECTIVES.

I. In the Perſian language, when Arabick Adjectives or Participles are made uſe of to qualify Arabick or Perſian Subſtantives Singular, they agree with them in Gender and Number.

Ex. 1. an Arabick ſub. maſc. qualified by an Arabick part. paſ. maſc. عاشق مذکور the ſaid lover.

2. an Arabick ſub. fem. qualified by an Arabick part. paſ. fem. والدهٔ مکرمه reſpected mother.

3. a Perſ. ſub. maſc. qualified by an Arabick ad. maſc. دوست قدیم an old friend.

4. a Perſ. ſub. fem. qualified by an Arabick ad. fem. همشیرهٔ عزیزه dear ſiſter.

II. When Arabick Adjectives and Participles are made uſe of to qualify Arabick and Perſian Subſtantives Maſculine and Plural, they remain in the Maſculine Singular.

Ex. 1. an Arab. ſub. maſc. plur. with an Arab. part. maſc. Sing. حکام مذکور the ſaid officers.

2. a Perſ. ſub. maſc. plur. with an Arab. part. maſc. Sing. برادران مذکور the ſaid brethren.

III. When Arabick Adjectives and Participles are made uſe of to qualify Arabick or Perſian Subſtantives Feminine and Plural, they are put in the Feminine Singular; and often, though not ſo properly, in the Maſculine Singular.

Ex. 1. an Arabick ſub. fem. plur. with Arabick part. Sing. both fem. maſ. تکلیفات مذکورهٔ مذکور the ſaid burthens.

2. a Perſian ſub. fem. plur. with Arabick part. Sing. both fem. and maſ. زنان موصوفه موصوف accompliſhed women.

IV. An Arabick Subſtantive, in the Perſian, is often rendered definite by a following Arabick Adjective or Participle having the article ال prefixed.

Ex. a ſub. with a part. paſ. نبي المختار the prophet elect.

For

For an account of the Genders of Arabick Words, and of their perfect and imperfect Plurals, I muſt again refer to Mr. Richardſon's Arabick Grammar; and to that of ERPENIUS, where the latter ſubject is treated at ſtill greater length.

OF THE INTRODUCTION OF THE ARABICK INTO THE LANGUAGE OF HINDOSTAN.

I. All the different ſpecies of Infinitives, Participles, Subſtantives and Adjectives which we have enumerated; and all compounds formed by *Arabick* and *Perſian* words, are introduced into the language of *Hindoſtan*, in the ſame form, for the ſame purpoſes, and with the ſame freedom as in the *Perſian*; ſubmitting themſelves to the different rules of regimen and concord, that are peculiar to *that* language; in the ſame manner as if they were words originally belonging to it. *Arabick* Adverbs, Prepoſitions, and Conjunctions are alſo uſed in the language of *Hindoſtan*; but I think leſs frequently than in the *Perſian*.

XV.

ON THE ASTRONOMICAL COMPUTATIONS OF THE HINDUS.

By SAMUEL DAVIS, *Esq.*

Bhágalpur, 15th Feb. 1789.

IT is, I believe, generally admitted, that inquiries into the aſtronomy of the *Hindus* may lead to much curious information, beſides what relates merely to the ſcience itſelf; and that attempts to aſcertain the chronology of this ancient nation will, as they have hitherto done, prove unſatisfactory, unleſs aſſiſtance be derived from ſuch reſearches.

The following communication is not expected to contribute towards ſo deſirable a purpoſe; but, with all its imperfections, it may have the uſeful effect of awakening the attention of others in this country, who are better qualified for ſuch inveſtigations, and of inciting them to purſue the ſame object more ſucceſsfully, by ſhowing that numerous treatiſes in *Sanſcrit* on aſtronomy are procurable, and that the *Bráhmens* are extremely willing to explain them. As an encouragement to thoſe, who may be inclined to amuſe themſelves in this way, I can farther venture to declare, from the experience I have had, that *Sanſcrit* books in this ſcience are more eaſily tranſlated than almoſt any others, when once the technical terms are underſtood: the ſubject of them admitting neither of metaphyſical reaſoning nor of metaphor, but being delivered in plain terms and generally illuſtrated with examples in practice, the meaning may be well enough made out, by the help of a *Pandit*, through the medium of the *Perſian* or the *Hindì* language.

Moreover it does not appear, that ſkill in the abſtruſe parts of modern mathematicks is indiſpenſably neceſſary, but that, with as much knowledge of geometry and the circles of the ſphere, as it may be ſuppoſed moſt of the members of this ſociety poſſeſs, a conſiderable progreſs might be made in revealing many intereſting particulars, which at preſent lie hid to *Europeans* in the *Jyótiſh*, or aſtronomical, *Sáſtra*.

The prediction of eclipſes and other phenomena, publiſhed in the *Hindu Patra*, or almanack, excited my curioſity long ago, to know by what means it was effected; but it was not until lately that I had any means of gratification: I had before this been inclined to think with many others, that the *Bráhmens* poſſeſs no more knowledge

ledge in aſtronomy than they have derived from their anceſtors in tables ready calculated to their hands, and that few traces of the principles of the ſcience could be found among them; but, by conſulting ſome *Sanſcrit* books, I was induced to alter my opinion. To ſatisfy myſelf on this ſubject, I began with calculating, by a modern *Hindu* formula, an eclipſe which will happen in next *November*; the particulars of which proceſs, although in ſome meaſure intereſting, were not ſufficient for my purpoſe, as it yet remained to be learnt, on what grounds ſome tables uſed in it were conſtructed; and for this information I was referred to the *Súrya Siddhánta*, an original treatiſe and reputed a divine revelation. For a copy of the *Súrya Siddhánta*, I am indebted to Sir ROBERT CHAMBERS, who procured it among other books at *Benares*; but the obſcurity of many technical terms made it ſome times difficult to be underſtood even by the *Pandit* I employed, who was by no means deeply verſed in the ſcience he profeſſed. By his diligence and through the obliging aſſiſtance of Mr. DUNCAN at *Benares*, who procured for me the *Tíçà* or Commentary, this difficulty was at length ſurmounted; and a computation of the above-mentioned eclipſe, not merely on the principles, but ſtrictly by the rules, of the *Súrya Siddhánta*, is what I propoſe now to preſent you with, after ſuch preliminary obſervations as may be neceſſary to make it intelligible.

I ſuppoſe it ſufficiently well known, that the *Hindu* diviſion of the ecliptick into ſigns, degrees, &c. is the ſame as ours; that their aſtronomical year is ſydereal, or containing that ſpace of time in which the ſun, departing from a ſtar, returns to the the ſame; that it commences on the inſtant of his entering the ſign *Aries*, or rather the *Hindu* conſtellation *Méſha* *: that each aſtronomical month contains as many even days and fractional parts, as he ſtays in each ſign; and that the civil differs from the aſtronomical account of time only in rejecting thoſe fractions, and beginning the year and month at ſunriſe, inſtead of the intermediate inſtant of the artificial day or night.

Hence ariſes the unequal portion of time aſſigned to each month dependant on the ſituation of the ſun's apſis, and the diſtance of the vernal equinoctial colure from the beginning of *Méſha* in the *Hindu* ſphere; and by theſe means they avoid thoſe errors, which *Europeans*, from a different method of adjuſting their calendar by intercalary days, have been ſubject to. An explanation of theſe matters would lead me beyond my preſent intention, which is to give a general account only of the method

* Or, to be more particular, on his entering the *Nacſhátra*, or lunar manſion (*Aſwini*). There were formerly only twenty-ſeven *Nacſhatras*; a 28th (*Abhijit*) has been ſince added, taken out of the 21ſt and 22d, named *Uttaráſhárà* and *Sravanà*. Theſe three in their order comprehend 10°, 5°, and 11° 40′ of the Zodiack: the reſt comprehend 13° 20′ each.

by

by which the *Hindus* compute eclipſes, and thereby to ſhow, that a late *French* author was too haſty, in aſſerting generally that they determine them "by ſet forms, couched in enigmatical verſes, &c. *" So far are they from deſerving the reproach of ignorance, which Monſ. SONNERAT has implied, that on enquiry, I believe, the *Hindu* ſcience of aſtronomy will be found as well known now, as it ever was among them, although, perhaps, not ſo generally, by reaſon of the little encouragement men of ſcience at preſent meet with, compared with what they formerly did under their native princes.

It has been common with aſtronomers to fix on ſome epoch, from which, as from a radix, to compute the planetary motions; and the ancient *Hindus* choſe that point of time counted back, when, according to their motions as they had determined them, they muſt have been in conjunction in the beginning of *Méſha* or *Aries*, and coeval with which circumſtance they ſuppoſed the creation. This, as it concerned the planets only, would have produced a moderate term of years compared with the enormous antiquity, that will be hereafter ſtated; but, having diſcovered a ſlow motion of the nodes and apſides alſo, and taken it into the computation, they found it would require a length of time correſponding with 1955884890 years now expired, when they were ſo ſituated, and 2364115110 years more, before they would return to the ſame ſituation again, forming together the grand anomaliſtick period denominated a *Calpa*, and fancifully aſſigned as the day of BRAHMA'. The *Calpa* they divided into *Manwanteras*, and greater and leſs *Yugas*. The uſe of the *Manwantera* is not ſtated in the *Súrya Siddhánta*, but that of the *Mahà*, or greater *Yug*, is ſufficiently evident, as being an anomaliſtick period of the ſun and moon, at the end of which the latter, with her apogee and aſcending node, is found, together with the ſun, in the firſt of *Aries*; the planets alſo deviating from that point, only as much as is their latitude and the difference between their mean and true anomaly.

Theſe Cycles being ſo conſtructed, as to contain a certain number of mean ſolar days, and the *Hindu* ſyſtem aſſuming, that at the creation, when the planets began their motions, a right line, drawn from the equinoctial point *Lancà* through the centre of the earth, would, if continued, have paſſed through the centres of the ſun and planets to the firſt ſtar in *Aries*, their mean longitude for any propoſed time afterwards may be computed by proportion. As the revolutions a planet makes in any cycle are to the number of days compoſing it, ſo are the days given to its motion in that time; and, the even revolutions being rejected, the fraction, if any, ſhows its

* See the tranſlation of Monſ. SONNERAT's Voyage.

mean

mean longitude at midnight under their firſt meridian of *Lancà:* for places eaſt or weſt of that meridian a proportional allowance is made for the difference of longitude on the earth's ſurface, called in *Sanſcrit* the *Déſántara.* The poſitions of the apſides and nodes are computed in the ſame manner, and the equation of the mean to the true place determined on principles, which will be hereafter mentioned.

The diviſion of the *Mahá Yug* into the *Satya, Tréta, Dwápar,* and *Cali,* ages, does not appear from the *Súrya Siddhánta* to anſwer any practical aſtronomical purpoſe, but to have been formed on ideas ſimilar to the *golden, ſilver, brazen,* and *iron* ages of the *Greeks.* Their origin has however been aſcribed to the preceſſion of the equinoxes by thoſe, who will of courſe refer the *Manwantera* and *Calpa* to the ſame foundation: either way the latter will be found anomaliſtick, as has been deſcribed, if I rightly underſtand the following paſſage in the firſt ſection of the *Súrya Siddhánta,* the tranſlation of which is, I believe, here correctly given.

——" Time, of the denomination *Murta* *, is eſtimated by reſpirations; ſix re-
" ſpirations make a *Vicalà,* ſixty *Vicalàs* a *Danda,* ſixty *Dandas* a *Nacſhatra* day, and
" thirty *Nacſhatra* days a *Nacſhatra* month. The *Sávan* month is that contained be-
" tween thirty ſucceſſive riſings of *Súrya,* and varies in its length according to the
" *Lagna Bhuja.* Thirty *Tit'hi's* compoſe the *Chándra* month. The *Saura* month is
" that, in which the ſun deſcribes one ſign of the zodiack, and his paſſage through the
" twelve ſigns is one year, and one of thoſe years is a *Déva* day, or day of the Gods.
" When it is day at *Aſura* †, it is night with the GODS, and when it is day with
" the GODS it is night at *Aſura.* Sixty of the *Déva* days multiplied by ſix give the
" *Déva* year, and twelve hundred of the *Déva* years form the aggregate of the four
" *Yugas.* To determine the *Saura* years contained in this aggregate, write down
" the following numbers, 4, 3, 2, which multiply by 10,000; the product 4320000
" is the aggregate or *Mahà Yuga,* including the *Sandhi* and *Sandhyanſa* ‡. This is
" divided into four *Yugas,* by reaſon of the different proportions of *Virtue* prevail-
" ing on earth, in the following manner. Divide the aggregate 4320000 by 10,

* This is mean ſydereal time:—A *Nacſhatra,* or ſyderal day, is the time in which the earth makes a turn upon its axis, or, according to the *Hindus,* in which the ſtars make one complete revolution. This is ſhorter than the *Sávan* or ſolar day, which varies in its length according to the *Lagna Bhuja,* or right aſcenſion, and alſo from the ſun's unequal motion in the ecliptick; for both which circumſtances the *Hindus* have their *equation of time,* as will appear in the calculation of the eclipſe.

† *Aſura,* the South Pole, the habitation of the *Aſura Lóca,* or Demons, with whom the *Devas,* who reſide at *Sumérv,* the North Pole, wage eternal war.

‡ *Sandhi* and *Sandhyanſa,* the morning and evening twilight. " The proper words, I believe, are *Sandhyà* and " *Sandhyánſa.*"

" two

" and multiply the quotient by four for the *Satya Yug*, by three for the *Tréta*, by " two for the *Dwápar*, and by one for the *Cali Yug*. Divide either of the *Yugs* " by ſix for its *Sandhi* and *Sandhyanſa*. Seventy-one *Yugs* make a *Manwantera*; " and at the cloſe of each *Manwantera* there is a *Sandhi* equal to the *Satya Yug*, " during which there is an univerſal deluge. Fourteen *Manwanteras*, including " the *Sandhi*, compoſe a *Calpa*, and at the commencement of each *Calpa* there is a " *Sandhi* equal to the *Satya Yug*, or 1728000 *Saura* years. A *Calpa* is therefore " equal to 1000 *Mahá Yugs*. One *Calpa* is a day with BRAHMA', and his night " is of the ſame length; and the period of his life is 100 of his years. One half " of the term of BRAHMA"s life, or fifty years, is expired, and of the remainder " the firſt *Calpa* is begun; and ſix *Manwantera's*, including the *Sandhi*, are ex- " pired. The ſeventh *Manwantera*, into which we are now advanced, is named " *Vaivaſwata:* of this *Manwantera* twenty-ſeven *Mahá Yugs* are elapſed, and we " are now in the *Satya Yug* of the twenty-eighth, which *Satya Yug* conſiſts of " 1728000 *Saura* years. The whole amount of years, expired from the beginning " of the *Calpa* * to the preſent time, may hence be computed; but from the num- " ber of years ſo found muſt be made a deduction of one hundred times four " hundred and ſeventy-four divine years, or of that product multiplied by three

* Conſtruction of the *Calpa*.

		Years.
Cali,	$\frac{4320000}{10} =$	432000
Dwápar,	$\frac{4320000}{10} \times 2 =$	864000
Tréta,	$\frac{4320000}{10} \times 3 =$	1296000
Satya,	$\frac{4320000}{10} \times 4 =$	1728000
Aggregate or *Mahá Yug*,		4320000
		71
Manwantera,		306720000
With a *Sandhi* equal to the *Satya Yug*		1728000
		308448000
		14
Calpa,		4318272000
With a *Sandhi* equal to the *Satya Yug*,		1728000
Whole duration of a *Calpa*,		4320000000

Computation of the period elapſed of the *Calpa* at the end of the laſt *Satya* age, when the *Súrya Siddhánta* is ſuppoſed to have been written.

	Years.
Sandhi at the beginning of the *Calpa*,	1728000
6 *Manwanteras* or 308448000 × 6 =	1850688000
27 *Mahá Yugs* of the 7th *Manwantera* or 4320000 × 27 =	116640000
Satya Age of the 28th *Mahá Yug*, =	1728000
	1970784000

hundred

" hundred and ſixty for human years, that being the term of BRAHMA"s employ-
" ment in the creation; after which the planetary motions commenced.

" Sixty *Vicalas* make one *Calá*, ſixty *Calás* one *Bhága*, thirty *Bhágas* one *Ráſi*,
" and there are twelve *Ráſis* in the *Bhagana* *.

" † In one *Yug*, *Súrya*, *Budha*, and *Sucra* perform 4320000 *Madhyama* revolu-
" tions through the Zodiack. *Mangala*, *Vrihaſpati*, and *Sani* make the ſame num-
" ber of *Sighra* revolutions through it; *Chandra* makes 57753336 ‡ *Madhyama*
" revolutions; *Mangala* 2296832 *Madhyama* revolutions; *Budha's Sighras* are
" 17937060; *Vrihaſpati's Madhyamas* 364220; *Sucra's Sighras* 7022376; *Sani's*
" *Madhyamas* are 146568. The *Chandróchcha* revolutions are 488203; the retro-
" grade revolutions of the *Chandrapáta* are 232238.

" The time contained between ſunriſe and ſunriſe is the *Bhúmi Sávan* day: the
" number of thoſe days contained in a *Yug* is 1577917828 §. The number of
" *Nacſhatra* days 1582237828 ‖; of *Chándra* days 1603000080; of *Adhi* months

* The diviſion of the *Bhagana*, or Zodiack, into Signs, Degrees, &c.

† *Súrya* the Sun; *Budha*, Mercury; *Sucra*, Venus; *Mangala*, Mars; *Vrihaſpati*, Jupiter; *Sani*, Saturn; *Chandra* the Moon; the *Chandra Uchcha*, or *Chandróchcha*, the Moon's Apogee; *Chandra Páta*, the Moon's aſcending Node. The *Madhyama* revolutions of Mars, Jupiter and Saturn, and the *Sighra* revolutions of Venus and Mercury, anſwer to their revolutions about the ſun.

‡ 57753336—4320000=53433336 lunar months, or lunations in a *Yug*; and $\frac{1577917828}{53433336}$ = $\overset{D.}{29}\ \overset{D.}{31}\ \overset{P.}{50}$, 6 &c.
$\overset{D.}{29}.\ \overset{H.}{12}.\ \overset{M.}{44}.\ \overset{S.}{2}.\ \overset{'''}{47}.\ \overset{''''}{36}.$ 53433336—51840000 = 1593336 *Adhi* or intercalary lunar months in 4320000 ſolar ſydereal years.

§ $\frac{1577917828}{4320000}$ = 366. 15. 31. 31. 24. diurnal revolutions of the Sun, the length of the *Hindu* year.

‖ $\frac{1582237828}{4320000}$ = 366. 15. 31. 31. 24. diurnal revolutions of the ſtars in one year. $\frac{1577917828}{57753336}$ = 27. 19. 18. 1. 37. &c. The Moon's periodical month. The 1603000080 *Chándra*, or lunar, days, called alſo *Tit'his*, are each one thirtieth part of the moon's ſynodical month or relative period, and vary in length according to the inequality of her motion from the ſun: the *Cſhaya Tit'his* and *Adhi*, or intercalary, lunar months are ſufficiently evident.

The ſun and planets preſide alternately over the days of the week, which are named accordingly. The firſt day after the creation was *Ravivár* or *Sunday*: it began at midnight under the meridian of *Lancà*, and the *Ravivár* of the *Hindus* correſponds with our Sunday. The ſun and planets in the ſame manner govern the years: hence they may be ſaid to have *weeks* of years. DANIEL's propheſy is ſuppoſed to mean *weeks* of years.

The *Hindu* Cycle of 60, ſuppoſed by ſome to be the Chaldean *Soſos*, is referred to the planet Jupiter: " one of " theſe years is equal to the time in which by his mean motion, he *(Vrihaſpati)* advances one degree in his orbit." (Commentary on the *Súrya Siddhánta*). This Cycle is, I believe, wholly applied to aſtrology. Neither this Cycle of 60 nor the *Pitri's* day are mentioned in this part of the *Súrya Siddhánta*, where they might be expected to occur: perhaps on inquiry there may be found ſome reaſon for ſuppoſing them both of a later invention. " The *Pitris* in-
" habit behind *Chándra*, and their mid-day happens when *Chándra* is in conjunction with *Súrya*, and their midnight,
" when *Chándra* is in oppoſition to *Súrya*; their morning, or ſunriſe, is at the end of half the *Criſhna Pacſha*, and their
" ſunſet at the end of half the *Sucla Pacſha*: this is declared in the *Sácalya Sanhità*. Their names are *Agni*, *Swáti*,
" &c. their day and night are therefore together equal to one *Chándra* month." (Commentary.) Hence it appears, the *Hindus* have obſerved that the moon revolves once on her axis in a lunar month, and conſequently has the ſame ſide always oppoſed to the earth. They have alſo noticed the difference of her apparent magnitude in the horizon and on the meridian, and endeavour to explain the cauſe of a phenomenon, which *Europeans* as well as themſelves are at a loſs to account for.

" 1593336; of *Cſhaya Tit'his* 25082252; of *Saura* months 51840000. From " either of the planets' *Nacſhatra* days deduct the number of its revolutions, the " remainder will be the number of its *Sávan* days contained in a *Yug*. The differ- " ence between the number of the revolutions of *Súrya* and *Chándra* gives the " number of *Chándra* months; and the difference between the *Saura* months and " *Chándra* months gives the number of *A'dhi* months. Deduct the *Sávan* days " from the *Chándra* days, the remainder will be the number of *Tit'hi Cſhayas*. The " number of *A'dhi* months, *Tit'hi Cſhayas*, *Nacſhatra*, *Chándra*, and *Sávan* days, " multiplied ſeverally by 1000, gives the number of each contained in a *Calpa*.

" The number of *Mandóchcha* revolutions, which revolutions are direct, or ac- " cording to the order of the ſigns contained in a *Calpa*, is of *Súrya* 387; of *Man-* " *gala* 204; of *Budha* 368; of *Vrihaſpati* 900; of *Sucra* 535; of *Sani* 39.

" The number of revolutions of the *Páta's*, which revolutions are retrograde, or " contrary to the order of the ſigns contained in a *Calpa*, is of *Mangala* 214; of " *Budha* 488; of *Vrihaſpati* 174; of *Sucra* 903; of *Sani* 662. The *Páta* and " *Uchcha* of *Chándra* are already mentioned."

It muſt be obſerved, that although the planetary motions as above determined might have ſerved for computations in the time of MEYA, the author of the *Súrya Siddhánta*, yet for many years paſt they have not been found to agree with the obſerved places in the heavens in every inſtance, and that corrections have accordingly been introduced by increaſing or reducing thoſe numbers. Thus the motions of the moon's apogee and node are now increaſed in computations of their places by the addition of four revolutions each in a *Yug* to their reſpective numbers above given. The nature of theſe corrections, denominated, in *Sanſcrit*, *Bíja*, is explained in a paſſage of the *Tícà*, or Commentary, on the *Súrya Siddhánta*, wherein is maintained the priority of that *Sáſtra* in point of time to all others. The tranſlation of that paſſage together with the text it illuſtrates is as follows:

(Súrya Siddhánta.) " ARCA (the Sun) addreſſing MEYA, who attended with " reverence, ſaid: Let your attention, abſtracted from human concerns, be wholly " applied to what I ſhall relate. SU'RYA in every former *Yug* revealed to the " *Munis* the invariable ſcience of aſtronomy. The planetary motions may alter; " but the principles of that ſcience are always the ſame."

(The Commentary.) " Hence it appears, that the *Súrya Siddhánta* was prior to " the *Brahma Siddhánta* and every other *Sáſtra*; becauſe this *Sáſtra* muſt be the " ſame that was revealed *in every former Yug*, although the motions of the planets

" might

" might have been different. This variation in the planetary motions is mentioned in " the *Viſhnu Dhermótter*, which directs that the planets be obſerved with an inſtru- " ment, whereby their agreement or diſagreement may be determined in regard to " their computed places, and in caſe of the latter an allowance of *Bíja* accordingly " made. VASISHT'HA in his *Siddhánta* alſo recommends this occaſional correction " of *Bíja*, ſaying to the *Muni* MA'NDAVYA: " I have ſhown you how to determine " ſome matters in aſtronomy; but the mean motion of *Súrya* and the other planets " will be found to differ in each *Yug*." " Accordingly A'RYABHATTA, BRAHMA- " GUPTA, and others, having obſerved the heavens, formed rules on the principles " of former *Sáſtras*, but which differed from each other in proportion to the diſ- " agreements, which they ſeverally obſerved, of the planets with reſpect to their " computed places.

" Why the *Munis*, who certainly knew, did not give the particulars of thoſe de- " viations, may ſeem unaccountable, when the men A'RYABHATTA, BRAHMA- " GUPTA, and others, have determined them: the reaſon was, that thoſe deviations " are not in themſelves uniform; and to ſtate their variations would have been " endleſs. It was therefore thought better, that examinations at different times " ſhould be made, and due corrections of the *Bíja* introduced. A *Ganita Sáſtra*, " whoſe rules are demonſtrable, is true; and when conjunctions, oppoſitions, and " other planetary phenomena, calculated by ſuch *Sáſtras*, are found not to agree " with obſervation, a proportionable *Bíja* may be introduced without any deroga- " tion from their credit. It was therefore neceſſary, that this *Sáſtra* (the *Súrya* " *Siddhánta*) ſhould be revealed in each *Yug*, and that other *Sáſtras* ſhould be com- " poſed by the *Munis*.

" The original *Sáſtra* then appears to be the *Súrya Siddhánta*; the ſecond, the " *Brahma Siddhánta*; the third, the *Paulaſtya Siddhánta*; the fourth, the *Sóma* " *Siddhánta*."

In the following table are given the periodical revolutions of the planets, their nodes and apſides, according to the *Súrya Siddhánta*. The corrections of *Bíja* at preſent uſed are contained in one column *, and the inclination of their orbits to the ecliptick in another. The obliquity of the ecliptick is inſerted according to the

* This I muſt however at preſent omit, not having as yet diſcovered the corrections of this kind, that will bring even the Sun's place, computed by the *Súrya Siddhánta*, exactly to an agreement with the aſtronomical books in preſent uſe. Of theſe books, the principal are, the *Grahalághava* compoſed about 268 years ago, the tables of *Macaranda* uſed at *Benares* and *Tirhút*, and the *Siddhánta Rahaſya* uſed at *Nádiyà*; the laſt written in 1513 *Sáca* or 198 years ago.

ſame

ſame *Sáſtra*. Its diminution does not appear to have been noticed in any ſubſequent treatiſe: in the tables of *Macaranda* and alſo in the *Grahalághava*, the latter written only 268 years ago, it is expreſsly ſtated at twenty-four degrees.

The Planets in their order.	*Sydereal Period.*	*Period of the Apſides.*	*Period of the Nodes.*	*Mean motion per day ′ ″ per danda ″ ‴*	*Inclination of the Orbit.*	Cacſha, *or circumference of the Orbit.*
	Days. D. P. V.	Days. D.	Days. D.	″ ″ ‴		*Yojan.*
The Moon,	27 19 18 1 &c.	3232 50 —	6794 23	790 35	4 30	324000
Mercury,	87 58 10 ———	428782018 46 —	3233742458 11	186 24	2 —	1043208
Venus,	281 39 38 ———	2949379117 45 &c.	1747417306 45	37	2 —	26646637
The Sun,	265 15 13 31 24	4077307049 5 —	Preceſſion of the equinoxes 54″ per year.	59 8	Obliquity of the Ecliptick 24°	4331500
Mars,	686 59 50 38	7735087392 9 &c.	7373447794 23 &c.	31 26	1 30	8146909
Jupiter,	4332 19 14 20 &c.	1753242031 6 &c	9068493264 22 &c.	5 —	1 —	51375764
Saturn,	10765 46 2 18 &c	4276712379 4 52 &c.	2383561673 42 &c.	2 —	2 —	127668255

The longitude of the ſun's apogee in the *Hindu* ſphere is 2^s, 17°, $17'$, $15''$, to which add the *Ayananſa* 19°, $21'$, $27''$, the ſum 3^s, 6°, $38'$, $42''$, is its place according to *European* expreſſion. In this the Hindu account differs about 1° $22'$ from the obſervations of *European* aſtronomers, who determine the place of the earth's aphelion in the preſent age to be in 9^s, 8°, $1'$. There is much greater diſagreement with reſpect to the aphelia and nodes of the other planets.

On ſuppoſition that the obliquity of the ecliptick was accurately obſerved by the ancient *Hindus*, as 24°, and that its decreaſe has been from that time half a ſecond a year, the date of the *Súrya Siddhánta* will be about 3840 years. It is remarkable that the *Hindus* do not appear to have noticed its decreaſe.

The *Cacſhas* are explained farther on.

The motion of the equinoxes, termed in *Sanſcrit* the *cránti*, and ſpoken of in the *Tícà*, or commentary, on the *Súrya Siddhánta* as the ſun's *Páta* or Node, is not noticed in the foregoing paſſage of that book; and, as the *Hindu* aſtronomers ſeem to entertain an idea of the ſubject different from that of its revolution through the *Platonick* year, I ſhall farther give a tranſlation of what is mentioned, both in the original and commentary, concerning it.

The next requiſite for the computation of the eclipſe is the portion of the *Calpa* expired to the preſent time, which is determined in the following manner.

The *Súrya Siddhánta* is ſuppoſed to have been received through divine revelation, towards the cloſe of the *Satya* age, at the end of which, 50 of the years of *Brahmá* were expired, and of the next *Calpa*, or day, 6 *Manwanteras*, 27

greater

greater *Yugs*, and the *Satya* age of the 28th *Yug*, together with the *Sandhya* or twilight at the beginning of the *Calpa*; the aggregate of which ſeveral periods is 1970784000 years elapſed of the *Calpa* to the beginning of the laſt *Treta* age; to which add the *Treta* and *Dwapar* ages, together with the years elapſed of the preſent *Cali* age, for the whole amount of ſydereal years from the beginning of the *Calpa* to the preſent *Bengal* year. But in the foregoing quotation it is obſerved, from that amount of years muſt be made a deduction of 47400 divine, or 17064000 human or ſydereal years, the term of *Brahmá*'s employment in the work of creation; for, as the univerſe was not completed, the planetary motions did not commence until that portion of the *Calpa* was elapſed.

This deduction appears to have been intended as a correction, which, without altering the date of the *Calpa*, as ſettled, probably, by yet more ancient aſtronomers, might (joined perhaps with other regulations) bring the computed places of the planets to an agreement with their obſerved places, when the *Súrya Siddhánta* was written; and, as the arguments of its commentator in ſupport of the propriety of it, without prejudice to other authors, contain ſome curious particulars, I hope I may be excuſed for departing from my immediate object to inſert a tranſlation of them.

"In the *Súrya Siddhánta*, *Sóma Siddhánta*, *Prajápeti*, *Vaſiſht'ha*, and other *Sáſtras*, "this deduction is required to be made from the *Calpa*, becauſe at the end of that "term, the planetary motions commenced. The ſon of JISHNU, who underſtood "four *Védas*, and BHA'SCARA'CHA'RYA, conſidered theſe motions as commencing "with the *Calpa*: it may ſeem ſtrange that there ſhould be ſuch a diſagreement. "Some men ſay: as it is written that the *Calpa* is the day of BRAHMA', and as a "day is dependent on the riſing and ſetting of the ſun, the motion of the ſun and "planets muſt have begun with the *Calpa*; and therefore BRAHMAGUPTA ſhould "be followed; but I think otherwiſe. The *Calpa* or BRAHMA''s day is not to be "underſtood as analogous to the ſolar day, otherwiſe than as containing a determined "portion of time; neither is it at all dependent on the commencement of the *Calpa*; "but, being compoſed of the ſame periods as the latter, it will not end until the term "of years here deducted ſhall be expired of the next *Calpa*. The motions of the "*Grahas* muſt therefore be computed from the point of time here ſtated as the be-"ginning of BRAHMA''s day, and not, as BRAHMAGUPTA and others direct, from "the beginning of the *Calpa*, which will not be found to anſwer.

"Other men ſay, that rules derived from the *Ganita Sáſtra* and agreeing with ob-"ſervation, are right; that any period deduced from ſuch a mode of computation,

"and

" and the planets determined to have been then in the firſt of *Méſha*, may be aſ-
" ſumed; that it will therefore anſwer either way, to conſider theſe motions as be-
" ginning with the *Calpa*, or after the above-mentioned period of it was expired.
" This, however, is not true; for in the inſtance of *Mangala* there will be found a
" great difference, as is here ſhown. The revolutions of *Mangala* in a *Calpa* accord-
" ing to BRAHMAGUPTA are 2296828522, and, by the rule of proportion, the revo-
" lutions of *Mangala* in 17064000 years are 9072472, Signs 7 28 0 16*. For any other
" planet, on trial, a ſimilar diſagreement will be found, and the propoſition of com-
" puting from either period muſt be erroneous. Moreover, of what uſe is it to make
" computations for a ſpace of time, when the planets and their motions were not in
" being?

" It might however from the foregoing circumſtances, be imputed to BRAHMAGUP-
" TA and the reſt, that they have given precepts through ignorance, or with intent to
" deceive--That, having ſtated the revolutions of the planets different from the account
" revealed by SU'RYA, they muſt certainly have been in error—That BRAHMAGUP-
" TA could not have counted the revolutions from the beginning of the *Calpa*; nei-
" ther could he from the mean motion of the planets have ſo determined them.—He
" was a mortal, and therefore could not count the revolutions.—Although the rule of
" proportion ſhould be granted to have ſerved his purpoſe for the revolutions of the
" planets, yet it certainly could not for thoſe of their *Mandóchcha*, becauſe it was not
" within the term of a man's life to determine the mean motion of the *Mandóchcha*;
" and this aſſertion is juſtified by the opinion of BHA'SCARA'CHA'RYA. But the rule
" of proportion could not have anſwered even for the planets; for, although their
" mean motion be obſerved one day, and again the next, how can a man be certain
" of the exact time elapſed between the two obſervations? And if there be the ſmall-
" eſt error in the elapſed time, the rule of proportion cannot anſwer for ſuch great
" periods. An error of the $\frac{1}{1000000}$ part of a ſecond *(Vicalà)* in one day amounts
" to forty degrees † in the computation of a *Calpa*, and the miſtake of $\frac{1}{10}$ of a re-
" ſpiration in one *Saura* year makes a difference in the ſame period of 20000 days.
" That it is therefore evident, BRAHMAGUPTA's motive, for directing the plane-
" tary motions to be computed as commencing with the *Calpa*, was to deceive man-
" kind, and that he had not the authority of the *Munis*, becauſe he differs from the

* Becauſe $\frac{2296828522 \times 17064000}{4320000000}$ = Revolutions 9072472, S. 7 28 0 16.

† The error would be more than 42°.

Súrya

" *Súrya Siddhánta*, *Bráhma Siddhánta*, *Sóma Siddhánta*; from VASISHT'HA and " other *Munis*.

" Such opinions would have no foundation, as I ſhall proceed to ſhow. BRAH- " MAGUPTA's rules are conſiſtent with the practice of the *Pandits* his predeceſ- " ſors; and he formed them from the *Purana Viſhnu Dhermóttara*, wherein is " contained the *Brahma Siddhánta*; and the periods given by A'RYABHATTA are " derived from the *Paráſera Siddhánta:* the precepts of the *Munis* are therefore " the authorities of BRAHMAGUPTA, A'RYABHATTA, and BHA'SCARA'CHA'RYA, " whoſe rules cannot be deceitful. The *Munis* themſelves differed with regard to " the number of *Sávan* days in a *Yug*, which is known from the *Pancha Sid-* " *dhánta* compoſed by VARA A'CHA'RYA, wherein are propoſed two methods of " computing the ſun's place, the one according to the *Súrya Siddhánta*, the other " according to *Rómacá Siddhánta*; whence it appears, that there were different " rules of computation even among the *Munis*. It is alſo mentioned in the *Tícà* " on the *Varáha Sanhitá*, that, according to the *Paulaſtya Siddhánta*, there was " formerly a different number of *Sávan* days eſtimated in a *Yug*. The maxims " therefore of BRAHMAGUPTA and the other two, agreeing with thoſe of the " *Munis*, are right; but, ſhould it even be ſuppoſed that the *Munis* themſelves " could be miſtaken, yet BRAHMAGUPTA and the other two had the ſanction of " the *Védas*, which in their numerous *Sác'has* (branches) have diſagreements of " the ſame kind; and, according to the *Sácalya Sanhità*, BRAHMA, in the revela- " tion he made to NA'RED, told him, although a circumſtance or thing were not " perceptible to the ſenſes, or reconcilable to reaſon, if authority for believing it " ſhould be found in the *Védas*, it muſt be received as true.

" If a planet's place, computed both by the *Súrya Siddhánta* and *Paráſera Sid-* " *dhánta*, ſhould be found to differ, which rule muſt be received as right? I an- " ſwer, that which agrees with his place by obſervation; and the *Munis* gave the " ſame direction. If computations from the beginning of the *Calpa*, and from " the period ſtated in the *Súrya Siddhánta* give a difference, as appears in the in- " ſtance of *Mangala*, which of the two periods to be computed from is founded " in truth? I ſay, it is of no conſequence to us which; ſince our object is only " to know which period anſwers for computation of the planetary places in our " time, not at the beginning of the *Calpa*. The difference found in computing " according to BRAHMAGUPTA and the *Munis* muſt be corrected by an allow-

" ance

" ance of *Bíja*; or by taking that difference as the *cſhépa*; but the books of the " *Munis* muſt not be altered, and the rules given by BRAHMAGUPTA, VARA'- " CHA'RYA, and A'RYABHATTA may be uſed with ſuch precautions. Any perſon " may compoſe a ſet of rules for the common purpoſes of aſtronomy; but, with " regard to the duties neceſſary in eclipſes, the computation muſt be made by the " books of the *Munis*, and the *Bíja* applied; and in this manner it was that VA- " RA'HA, A'RYABHATTA, BRAHMAGUPTA, and CE'SAVA SAMVATSARA, hav- " ing obſerved the planets and made due allowance of *Bíja*, compoſed their books.

" GANE'SA mentions, that the *Grahas* were right in their computed places in " the time of BRAHMA', A'CHA'RYA, VASISHT'HA, CASYAPA, and others by the " rules they gave, but in length of time they differed; after which, at the cloſe of " the *Satya* age, SU'RYA revealed to MEYA a computation of their true places. " The rules then received anſwered during the *Trétà* and *Dwápar* ages, as alſo did " other rules formed by the *Munis* during thoſe periods. In the beginning of the " *Cali Yug*, PARA'SERA's book anſwered; but A'RYABHATTA, many years after, " having examined the heavens, found ſome deviation, and introduced a correction " of *bíja*. After him, when further deviations were obſerved, DURGA' SINHA, " MIHIRA and others made corrections. After them came the ſon of JISTNU " and BRAHMAGUPTA and made corrections. After them CE'SAVA ſettled the " places of the planets, and, ſixty years after CE'SAVA, his ſon GANE'SA made " corrections."

We have now, according to the *Hindu* ſyſtem, the mean motion of the planets, their nodes and apſides, and the elapſed time ſince they were in conjunction in the firſt of *Méſha*, with which, by the rule of proportion, to determine their mean longitude for any propoſed time of the preſent year. It is however obſerved in the *Súrya Siddhánta*, that to aſſume a period ſo great is unneceſſary; for uſe the computation may be made from the beginning of the *Trétà* age, at which inſtant all the *Grahas*, or moveable points in the heavens, were again in conjunction in *Méſha*, except the apogees and aſcending nodes, which muſt, therefore, be computed from the creation. The ſame is true of the beginning of the preſent *Cali* age; for the greateſt common diviſor of the number of days compoſing the *Mahà Yug* and the planetary revolutions in that period, is four, which quotes 394479457 days or 1080000 years, and the *Trétà* and *Dwápar* ages contain together juſt that number of years. The preſent *Hindu* aſtronomers therefore find it unneceſſary to go farther back

back than the beginning of the *Cali Yug* * in determining the mean longitude of the planets themſelves; but for the poſition of their apſides and nodes, the elapſed time ſince the creation muſt be uſed; or at leaſt in inſtances, as of the ſun, when the numbers 387 and 4320000000 are incommenſurable but by unity. I have however in the accompanying computation, taken the latter period in both caſes.

For the equation of the mean to the true anomaly, in which the ſolution of triangles is concerned, and which is next to be conſidered, the *Hindus* make uſe of a canon of ſines conſtructed according to the *Súrya Siddhánta* in the following manner.—" Divide the number of minutes contained in one ſign 1800 by eight, the " quotient 225′ is the firſt *Jyápinda*, or, the firſt of the twenty-fourth portions of " half the ſtring of the bow. Divide the firſt *Jyápinda* by 225′, the quotient 1′ " deduct from the dividend, and the remainder 224′ add to the firſt for the ſecond " *Jyápinda* 449′. Divide the ſecond *Jyápinda* by 225′, the quotient being 1′ and " the fraction more than half a minute, deduct 2′ from the foregoing remainder " 224′ and add the remainder, ſo found, to the ſecond for the third *Jyápinda* 671′. " Divide this by 225′, the quotient 3′ deduct from the laſt remainder 222′; the " remainder ſo found 219′ add to the third for the fourth *Jyápinda* 890′. Divide " this by 225′ and the quotient deduct from the laſt remainder, the remainder ſo " found add to the fourth for the fifth *Jyápinda* 1105, and proceed in this manner " until the twenty-four *Cramajyás* † are completed, which will be as follows:

1	2	3	4	5	6	7	8	9	10	11	12
225,	449,	671,	890,	1105,	1315,	1520,	1719,	1910,	2093,	2267,	2431,
13	14	15	16	17	18	19	20	21	22	23	24
2585,	2728,	2859,	2978,	3084,	3177,	3256,	3321,	3372,	3409,	3431,	3438.

" For the *utcramajyà* ‡, the twenty-third *cramajyà* deducted from the *trijyá* or " twenty-fourth *cramajyà*, leaves the firſt *utcramajyà*; the twenty-ſecond deduct- " ed from the twenty-third leaves the ſecond *utcramajyà*; the twenty-firſt from " the twenty-ſecond leaves the third; the twentieth from the twenty-firſt leaves " the fourth. In the ſame manner proceed until the *utcramajyà's* are com-

* Neither do they in computing by the formulas in common uſe go farther back than to ſome aſſigned date of the era *Saca*, but, having the planets' places determined for that point of time, they compute their mean places and other requiſites for any propoſed date afterwards by tables, or by combinations of figures contrived to facilitate the work: as in *Grahalághava*, *Siddhánta Rahaſya* and many other books. An inquirer into *Hindu* aſtronomy having acceſs to ſuch books only, might eaſily be led to aſſert that the *Bráhmans* compute eclipſes *by ſet forms couched in enigmatical verſes*, out of which it would be difficult to develop their ſyſtem of aſtronomy; and this I apprehend was the caſe with Monſ. SONNERAT. The *Jyótiſh Pandits* in general, it is true, know little more of aſtronomy than they learn from ſuch books, and they are conſequently very ignorant of the principles of the ſcience: but there are ſome to be met with, who are better informed.

† *Cramajyás*, Right Sines.

‡ *Utcramajyàs*, Verſed Sines.

" pleted

" pleted; which will be as follows: 1 7, 2 29, 3 66, 4 117, 5 182, 6 261, 7 354, 8 460, 9 579,
" 10 710, 11 853, 12 1007, 13 1171, 14 1345, 15 1528, 16 1719, 17 1928, 18 2123, 19 2233, 20 2548, 21 2767,
" 22 2989, 23 3213, 24 3438." So far the *Súrya Siddhánta* on the ſubject of the ſines. The commentator ſhows how they are geometrically conſtructed: " with a radius " deſcribe a circle, the periphery of which divide into 21600 equal parts or mi- " nutes. Draw North and South, and Eaſt and Weſt lines through the centre: " ſet off contrariwiſe from the eaſt point, 225 on the periphery, and draw a ſtring " from thoſe extremities acroſs the *trijyà* *. The ſtring is the *jyà*, and its half the " *ardhajyà* called *jivà*. The *Pandits* ſay, a planet's place will correſpond with the " *ardhajyà*, by which, therefore, computations of their places are always made, " and by the term *jyà* is always underſtood the *ardhajyà*. The firſt *jyà* will be " found to contain 449 minutes, and the operation, repeated to twenty-four divi- " ſions, will complete the *cramajyà*. In each operation, the diſtance contained " between the *jyà* and its arc, or, that line which repreſents the arrow of a bow, " muſt be examined, and the number of minutes therein contained taken for the " *utcramajyà*. The circle may repreſent any ſpace of land; the *bhujajyà* † is the " *bhuja*; the *cótijyà* the *cóti*, and the *trijyà* the *carna*. The ſquare of the *bhujajyà* " deducted from the ſquare of the *trijyà* leaves the ſquare of the *cótijyà*; the root " of which is the *cótijyà*; and, in the ſame manner, from the *cótijyà* is determined " the *bhujajyà*. The *cótyutcramajyà* deducted from the *trijyà* leaves the *bhujacra-* " *majyà*. The *bhujótcramajyà* deducted from the *trijyà* leaves the *cóticramajyà*. " When the *bhujajyà* is the firſt diviſion of the *trijyà*, the *cótijyà* is the twenty- " three remaining diviſions, which *cótijyà* deducted from the *trijyà* leaves the " *bhujótcramajyà*. On this principle are the *jyàs* given in the text ‡: they may be " determined by calculation alſo, as follows:

" The *trijyà* take as equal to 3438 minutes and containing twenty-four *jyápin-* " *das:* its half is the *jyà* of one ſign or 1719′: which is the eighth *jyápinda* or the " ſixteenth *cotijyápinda*. The ſquare of the *trijyà* multiply by three, and divide " the product by four, the ſquare root of the quotient is the *jyà* of two ſigns or " 2977′. The ſquare root of half the ſquare of the *trijyà* is the *jyà* of one ſign " and an half (45°) or 2431′; which deducted from the *trijyà* leaves the *utcra-*

* *Trijyà*, the Radius. † *Bhujajyà*, the Sine complement.
‡ A diagram might here be added for illuſtration, but it muſt be unneceſſary to any one who has the ſmalleſt knowledge of geometry.

" *majyà*

" *mayjà* 1007'. By this *utcramajyà* multiply the *trijyà*; the ſquare root of half " the product is the *jyà* of 22°, 30', or 1315'. The ſquare of this deduct from " the ſquare of the *trijyà*, the ſquare root of the difference is the *jyà* of 67°, 30', " or 3177', which is the *cótijyà* of 22°, 30', equal to 1315'. This *bhujajyà* and " *cótijyà* deducted ſeverally from the *trijyà*, leaves the *utcramajyà* of each, 2123', " and 261'.—&c."

This is ſufficient to ſhow, that the *Hindus* have the right conſtruction of the ſines, although they do not appear, from any thing I can learn, ever to have carried it farther than to twenty-four diviſions of the quadrant, as in the following table. Inſtances of the like inaccuracy will occur in the courſe of this paper. The table of ſines may perhaps be more clearly repreſented in the following manner.

Right Sines, the Radius containing 3438 *Minutes.*

Arc.	Sine.	Arc.	Sine.	Arc.	Sine.
1ſt = 225' = 3°,45'	225'	9th = 2025' = 33°,45'	1910'	17th = 3825' = 63°,45'	3084'
2d = 450 = 7 ,30	449	10th = 2250 = 37 ,30	2093	18th = 4050 = 67 ,30	3177
3d = 675 = 11 ,15	671	11th = 2475 = 41 ,15	2267	19th = 4275 = 71 ,15	3256
4th = 900 = 15 ,—	890	12th = 2700 = 45 ,—	2431	20th = 4500 = 75 ,—	3321
5th = 1125 = 18 ,45	1105	13th = 2925 = 48 ,45	2585	21ſt = 4725 = 78 ,45	3376
6th = 1350 = 22 ,30	1315	14th = 3150 = 52 ,30	2728	22d = 4950 = 82 ,30	3409
7th = 1575 = 26 ,15	1520	15th = 3275 = 56 ,15	2859	23d = 5175 = 86 ,15	3431
8th = 1800 = 30 ,—	1719	16th = 3600 = 60 ,—	2978	24th = 5400 = 90 ,—	3438

Verſed Sines.

Arc.	Sine.	Arc.	Sine.	Arc.	Sine.
1ſt = 225' = 3°,45'	7'	9th = 2025' = 33°,45'	579'	17th = 3825' = 63°,45'	1928'
2d = 450 = 7 ,30	29	10th = 2250 = 37 ,30	710	18th = 4050 = 67 ,30	2123
3d = 675 = 11 ,15	66	11th = 2475 = 41 ,15	853	19th = 4275 = 71 ,15	2233
4th = 900 = 15 ,—	117	12th = 2700 = 45 ,—	1007	20th = 4500 = 75 ,—	2548
5th = 1125 = 18 ,45	182	13th = 2925 = 48 ,45	1171	21ſt = 4725 = 78 ,45	2767
6th = 1350 = 22 ,30	261	14th = 3150 = 52 ,30	1345	22d = 4950 = 82 ,30	2989
7th = 1575 = 26 ,15	354	15th = 3275 = 56 ,15	1528	23d = 5175 = 86 ,15	3213
8th = 1800 = 30 ,—	466	16th = 3600 = 60 ,—	1719	24th = 5400 = 90 ,—	3438

For the ſines of the intermediate arcs, take a mean proportion of the tabular difference, as for the ſine of 14°, which is between the third and fourth tabular arcs, or 165 minutes exceeding the third; therefore 225' being the difference of thoſe arcs,

arcs, and 219 the difference of their ſines, $\frac{165' \times 219'}{225'} = 160', 36''$, or a mean proportional number, to be added to the ſine of the third tabular arc, for the ſine required of 14° or 831′ 36″. In the ſexageſimal arithmetick, which appears to be univerſally uſed in the *Hindu* aſtronomy, when the fraction exceeds half unity, it is uſually taken as a whole number; thus, 831′, 35″, 35‴, would be written 831′, 36″.

To account for the apparent unequal motion of the planets, which they ſuppoſe to move in their reſpective orbits through equal diſtances in equal times, the *Hindus* have recourſe to excentrick circles, and determine the excentricity of the orbits of the ſun and moon with reſpect to that circle, in which they place the earth as the centre of the univerſe, to be equal to the ſines of their greateſt anomaliſtick equations, and accordingly that the delineation of the path of either may be made in the following manner:

Deſcribe a circle, which divide as the ecliptick into ſigns, degrees, and minutes; note the place of the *Mandóchcha,* or higher apſis, which ſuppoſe in ♉. Draw a diameter to that point, and ſet off, from the centre ⊕ towards the place of the apogee, the excentricity equal to the ſine of the greateſt equation, which of the ſun is 130′ 32″. Here the excentricity is repreſented much greater, that the figure may be better underſtood. Round the point E, as the centre, deſcribe the excentrick circle FGHI, which is the ſun's orbit, and in the point H, where it is cut by the line ⊕ ♉ prolonged, is the place of the *Mandóchcha,* or higher apſis, and in the oppoſite point F is the lower. From the place of the apogee H, ſet off its longitude in reverſe, or contrary to the order of the ſigns, for the beginning of *Aries*, and divide this circle, as the former, into ſigns and degrees. Note the ſun's mean longitude in each circle, as ſuppoſe in *Gemini,* and from both points draw right lines to the earth at ⊕: according to the *Hindu* ſyſtem, which appears to be the ſame as the *Ptolemaick*, the angle $a \oplus C$, will be the mean anomaly, the angle $b \oplus C$, the true anomaly, and the angle $a \oplus b$, their difference, or the equation of the mean to the true place; to be ſubtracted in the firſt ſix ſigns of anomaly, and added in the laſt ſix. The *Europeans* in the old aſtronomy found the angle $b \oplus C$ by the following proportion, and which ſubtracted from $a \oplus C$ left the equation, which, as the *Hindus*, they inſerted in tables calculated for the ſeveral degrees of the quadrant;—as the co-ſine of the mean anomaly $\oplus e = Ed$ added to the excentricity $E\oplus$, is to the ſine of the mean anomaly $ae = bd$; ſo is radius, to the tangent of the true anomaly: or, in the right-angled triangle $d \oplus b$, in which are given $d \oplus$ and bd,

if

Fig. 1.

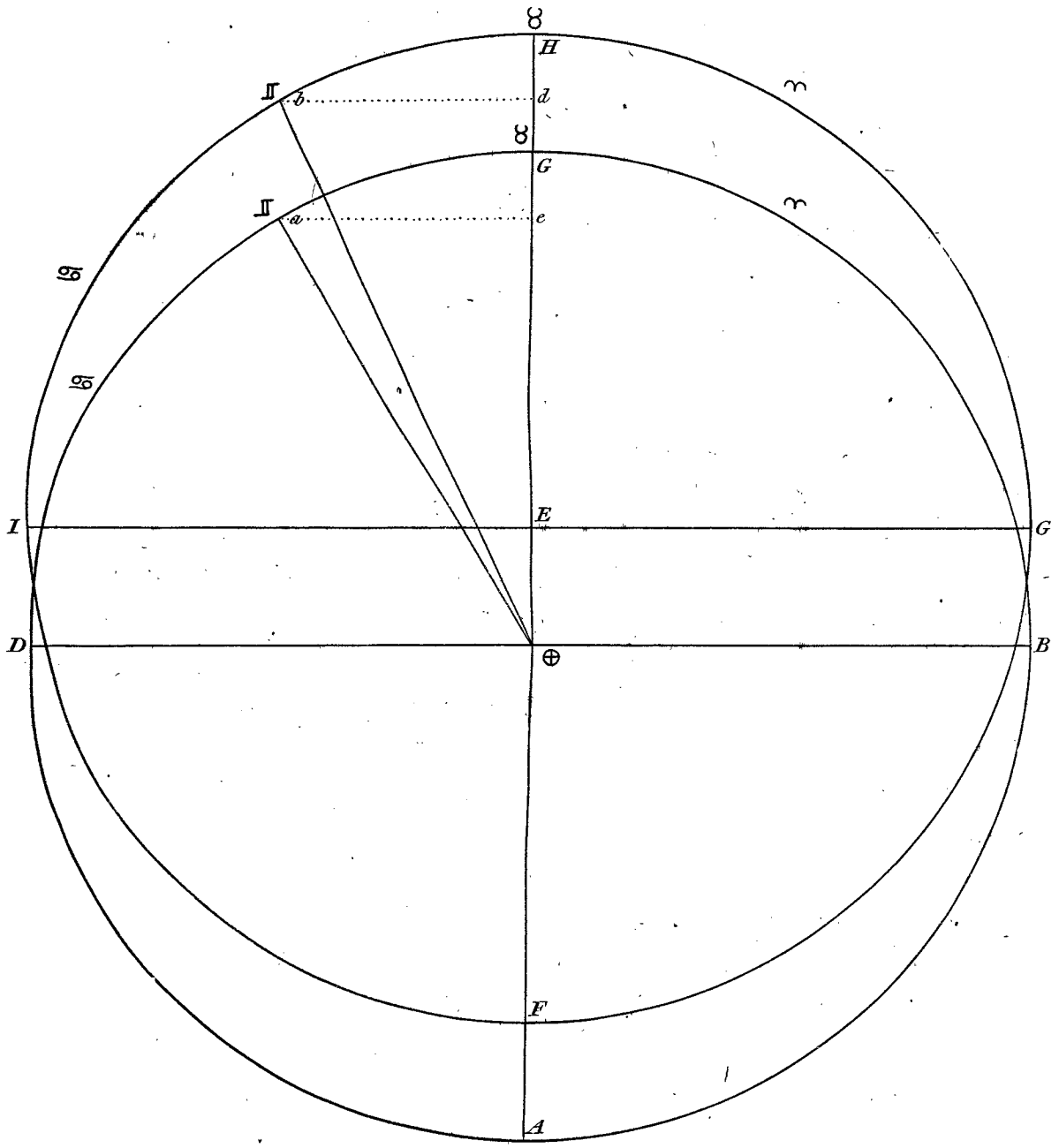
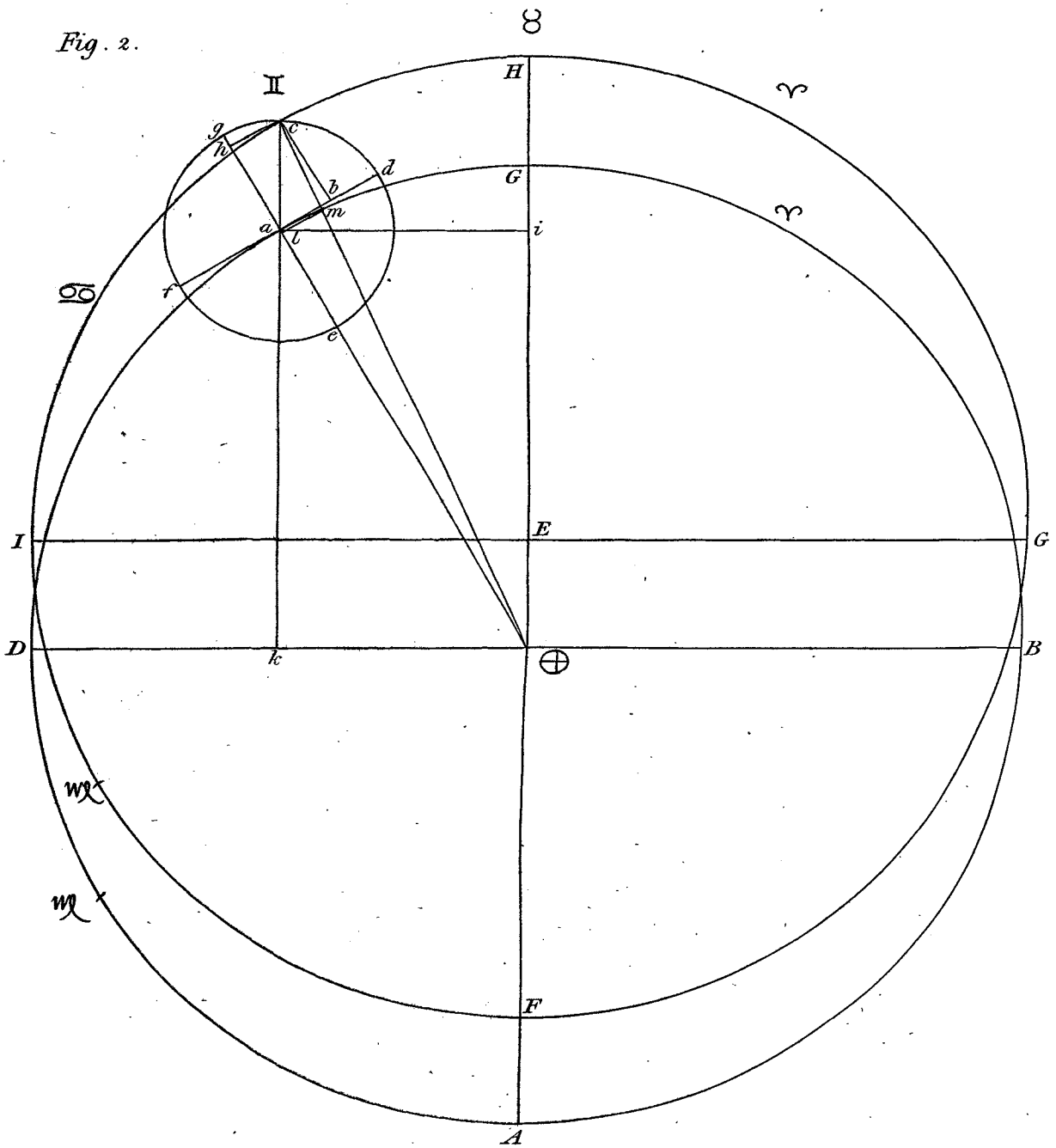


Fig. 2.



if $d\oplus$ be made radius, bd will be the tangent of the angle $b\oplus d$, required. The *Hindus* who have not the invention of *tangents*, take a different method, on principles equally true. They imagine the ſmall circle or epicycle, *cdef*, drawn round the planet's mean place *a* with a radius equal to the excentricity, which in this caſe, of the ſun, is 13′ 30″, and whoſe circumference in degrees, or equal diviſions of the deferent ABCD, will be in proportion as their ſemi-diameters; or, as $\oplus C$=3438′, to ABCD=360°, ſo ag=13′ 32″, to $efgd$=13° 40′; which is called the *paridhi-anſa* or *paridhi* degrees. In the ſame proportion alſo will be the correſpondent ſines *bc* and *ai*, and their co-ſines *cb* and *lk*, which are therefore known by computation, in minutes, or equal parts of the radius $a\oplus$, which contains, as before mentioned 3438′. In the right-angled triangle $b\oplus c$, right-angled at *b*, there are given the ſides $b\oplus$ ($=a\oplus+cb$, becauſe $cb=ba$), and $b\oplus$; to find the hypotenuſe $c\oplus$, by means of which the angle $a\oplus m$ may be determined; for its ſine is *lm*, and, in the ſimilar triangles $bc\oplus$ and $lm\oplus$, as $c\oplus$ is to $m\oplus$, ſo is *bc* to *lm*, the ſine of the angle of equation. From the third to the ninth ſigns of anomaly, the coſine *cb* muſt be ſubtracted from the radius 3438′ for the ſide $b\oplus$.

It is, however, only in computing the retrogradations and other particulars reſpecting the planets *Mercury*, *Venus*, *Mars*, *Jupiter* and *Saturn*, where circles greatly excentrick are to be conſidered, that the *Hindus* find the length of the *carna* or hypotenuſe $c\oplus$; in other caſes, as for the anomaliſtick equations of the ſun and moon, they are ſatisfied to take *bc* as equal to the ſine *lm*, their difference, as the commentator on the *Súrya Siddhánta* obſerves, being inconſiderable.

Upon this hypotheſis are the *Hindu* tables of anomaly computed with the aid of an adjuſtment, which, as far as I know, may be peculiar to themſelves. Finding, that, in the firſt degree of anomaly both from the higher and lower apſis, the difference between the mean and obſerved places of the planets was greater than became thus accounted for, they enlarged the epicycle in the apogee and perigee, proportionably to that obſerved difference, for each planet reſpectively, conceiving it to diminiſh in inverſe proportion to the ſine of the mean anomaly, until at the diſtance of three ſigns, or half way between thoſe points, the radius of the epicycle ſhould be equal to the excentricity or ſine of the greateſt equation. This aſſumed difference in the magnitude of the epicycle, they called the difference of the *paridhianſa*, between *viſhama* and *ſama*, the literal meaning of which is *odd* and *even*. From the firſt to the third ſign of anomaly, or rather in the third, a planet is in *viſhama*; from the third to the ſixth, or in the perigee, in *ſama*; in the ninth ſign,

in

in *viſhama*; and in the twelfth, or the apogee, in *ſama*. The *paridhi* degrees, or circumference of the epicycle, in *ſama* are, of the ſun 14° in *viſhama* 13° 40′; of the moon in *ſama* 32°, in *viſhama*, 31° 40′; the difference aſſigned to each between *ſama* and *viſhama*, 20′.

To illuſtrate theſe matters by examples, let it be required to find the equation of the ſun's mean, to his true place in the firſt degree of anomaly. The ſine of 1° is conſidered as equal to its arc, or 60.—The circumference of the epicycle in *ſama*, or the *apogee*, is 14°, but diminiſhing in this caſe towards *viſhama*, in inverſe proportion to the ſine of anomaly.—Therefore, as radius 3438 is to the difference between *ſama* and *viſhama* 20′, ſo is the ſine of anomaly 60′ to the diminution of the epicycle in the point of anomaly propoſed, 20″ ($=\frac{60'+20'}{34\ 38}$) which ſubtracted from 14° leaves 13° 59′ 40″. Then, as the circumference of the great circle 360° is to the circumference of the epicycle 13° 59′ 40″; ſo is the ſine of anomaly 60′ to its correſpondent ſine in the epicycle *hc*, which, as was obſerved, is conſidered as equal to *lm*, or true ſine of the angle of equation 2′ 19″ 56‴ ($=\frac{13°\ 59'\ 40''+60'}{360°}$), which, in the *Hindu* canon of ſines, is the ſame as its arc, and is therefore the equation of the mean to the true place in 1° of anomaly, to be added in the firſt ſix ſigns and ſubtracted in the laſt ſix.

For the equation of the mean to the true place in 5° 14′ of anomaly. The ſine of 5° 14′ is 313′ 36″ 8‴ and $\frac{313'\ 36''\ 8'''+20'=6272'\ 2''\ 40'''}{3438'}=1'\ 49''$, to be deducted from the *paridhi* degrees in *ſama*.—14° 1′ 49″=13° 58′ 11″, and $\frac{313'\ 36''\ 8'''+13°\ 58'\ 11''=4379'\ 59''\ 37'}{360°}$ =14′ 9″ 59‴ the ſine of the angle of equation, which is equal to its arc.

For the ſame in 14° of anomaly. The ſine of 14° is 831′ 36″—$\frac{831'\ 36''\times 20'}{3438'}=4'\ 50''$, and, $\frac{14°-4'\ 50''\times 831'\ 38''}{360°}=32'\ 9''$ the ſine of the angle of equation.

For the ſame in two ſigns of anomaly. The ſine of 60° is 2978′ $\frac{2078'\times 20'}{3438'}=17'\ 19''$, and $\frac{14°-17'\ 19''\times 2978'}{360°}=113'\ 25''\ 20'''$, the ſine of the equation, equal to its arc.

For the equation of the mean to the true place of the moon in 1° of anomaly. The *paridhi* degrees of the moon in *ſama* are 32°, *in viſhama* 31° 40′, the difference 20′. The ſine of 1° is 60′ and $\frac{60'\times 20''}{3438'}=21''$, to be deducted from the *paridhi* degrees in *ſama*, 32°—21″=31° 59′ 39″. $\frac{31°\ 59'\ 39''+60'}{360°}=5'\ 20''$, the equation required.

For

For the ſame in ten degrees of anomaly. The ſine of 10° is 597′ $\frac{597' \times 20'}{3438'} = 3'\ 28''$, and $\frac{32° - 3'\ 28'' \times 507'}{360°} = 52'\ 58''$, the equation required.

For the ſame in three ſigns of anomaly. The ſine of 90° is the radius or 3438′, and $\frac{3438' \times 20'}{3438'} = 20'$, $\frac{32° - 20' \times 3438'}{360°} = 302'\ 25''$, the ſine of the greateſt angle of equation, equal to the radius of the epicycle in this point of anomaly, the arc correſponding with which is 302′ 45″, the equation required.

For the equation of the mean to the true motion in theſe ſeveral points of anomaly, ſay, as radius 3438, is to the mean motion, ſo is the co-ſine *c b* of the anomaliſtick angle *g a c* in the epicycle, to the difference between the mean and apparent motion, or the equation required, to be ſubtracted from the mean motion in the firſt three ſigns of anomaly; added, in the next ſix; and ſubtracted in the laſt three.

EXAMPLE, for the ſun, in 5° 14′ of anomaly. The co-ſine of 5° 14′ in the *Hindu* canon is 3422′ 17″ 52‴. The *paridhi* circle in this point found before is 13° 58′ 11″; and $\frac{3422'\ 17''\ 52''' + 13°\ 58'\ 11''}{360°} = 132'\ 48''$, the co-ſine *c b* in the epicycle; then, as radius 3438′ is to the ſun's mean motion 59′ 8″ per day, or 59″ 8‴ per *danda*; ſo is the co-ſine *c b* = 132′ 48″, to the equation required, 2′ 17″ per day, or 2″ 17‴ per *danda*. The motion of the ſun's apſis is ſo ſlow as to be neglected in theſe calculations; but that of the moon is conſidered, in order to know her mean motion from her apogee, which is 783′ 54″.

In this manner may be determined the equation of the mean to the true anomaly and motion for each degree of the quadrant, and which will be found to agree with the tables of *Macaranda*. The following tables are tranſlated from that book:

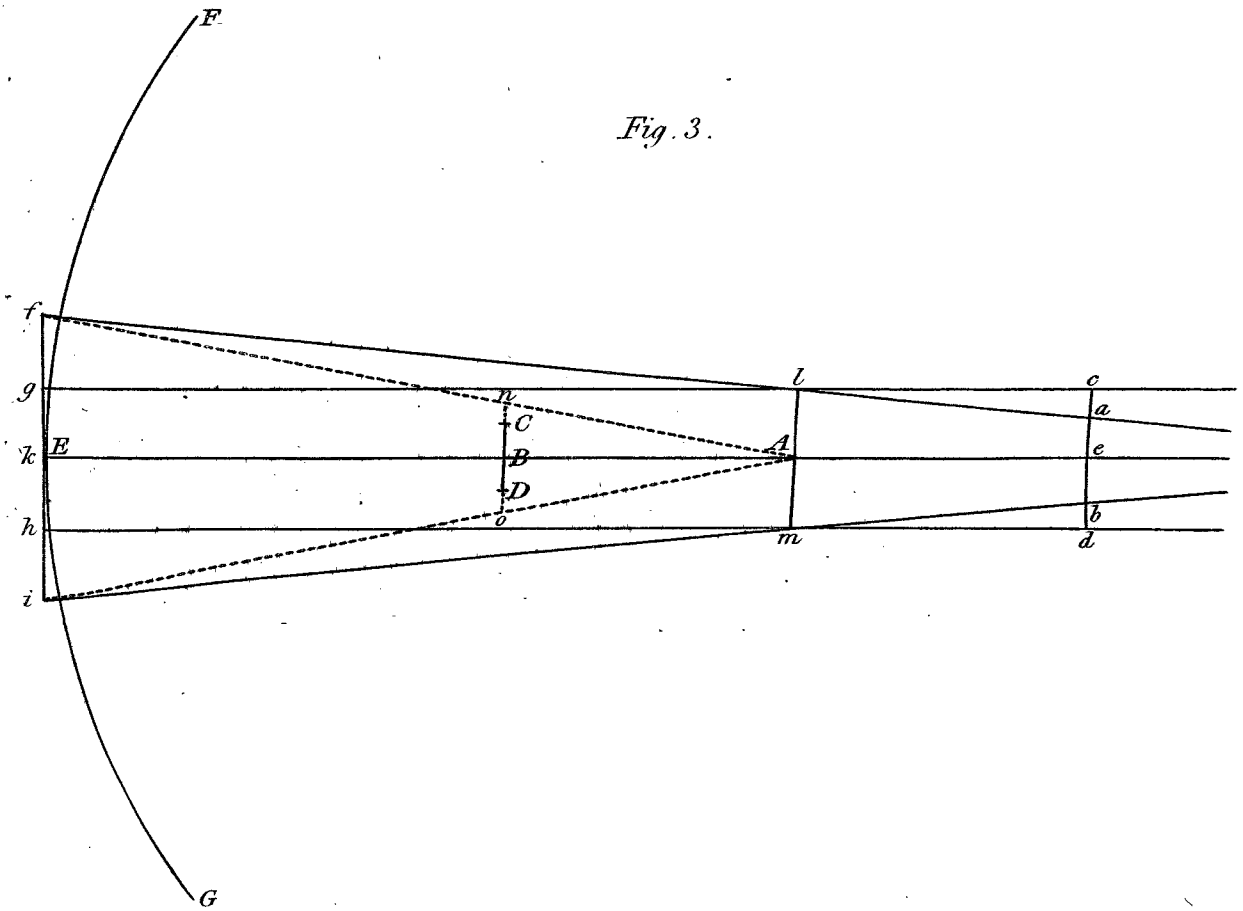
Solar Equations, *Ravi p'hala.*

Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.
°	° ′ ″	′ ″	°	° ′ ″	′ ″	°	° ′ ″	′ ″
1	2 20	2 18	31	1 8 —	1 55	61	1 54 30	1 4
2	4 40	2 18	32	1 9 57	1 53	62	1 55 34	1
3	7 —	2 18	33	1 11 57	1 53	63	1 56 35	58
4	9 19	2 17	34	1 13 47	1 51	64	1 57 34	57
5	11 37	2 17	35	1 15 40	1 51	65	1 58 34	55
6	13 56	2 17	36	1 17 32	1 49	66	1 59 30	55
7	16 15	2 16	37	1 19 23	1 47	67	2 — 23	52
8	18 33	2 16	38	1 21 11	1 45	68	2 1 14	49
9	20 51	2 15	39	1 22 57	1 43	69	2 2 4	46
10	23 7	2 14	40	1 24 42	1 42	70	2 2 51	43
11	25 23	2 14	41	1 26 26	1 40	71	2 3 35	41
12	27 39	2 13	42	1 28 7	1 38	72	2 4 17	39
13	29 55	2 13	43	1 29 46	1 36	73	2 4 57	37
14	32 10	2 12	44	1 31 23	1 34	74	2 5 35	35
15	34 24	2 11	45	1 32 58	1 32	75	2 6 12	32
16	36 37	2 11	46	1 34 32	1 30	76	2 6 45	31
17	38 39	2 10	47	1 36 4	1 29	77	2 7 17	28
18	41 1	2 9	48	1 37 35	1 28	78	2 7 45	25
19	43 12	2 8	49	1 39 6	1 28	79	2 8 12	23
20	45 22	2 7	50	1 40 36	1 26	80	2 8 35	22
21	47 31	2 6	51	1 42 3	1 23	81	2 8 58	20
22	49 39	2 6	52	1 43 26	1 19	82	2 9 18	18
23	51 47	2 5	53	1 44 45	1 16	83	2 9 36	15
24	53 53	2 3	54	1 46 2	1 14	84	2 9 51	12
25	55 57	2 2	55	1 47 17	1 13	85	2 10 3	10
26	58 1	2 1	56	1 48 33	1 13	86	2 10 13	8
27	1 — 2	2 —	57	1 49 47	1 12	87	2 10 20	6
28	1 2 53	1 58	58	1 51 —	1 11	88	2 10 27	4
29	1 4 3	1 57	59	1 52 12	1 11	89	2 10 31	1
30	1 6 2	1 56	60	1 53 25	1 8	90	2 10 32	

Lunar Equations, *Chándra p'hala.*

Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.
°	° ′ ″	′ ″	°	° ′ ″	′ ″	°	° ′ ″	′ ″
1	5 20	69 39	31	2 36 37	59 20	61	4 25 26	33 41
2	10 40	69 38	32	2 41 11	58 41	62	4 27 36	32 39
3	16 —	69 33	33	2 45 36	58 —	63	4 29 59	31 35
4	21 19	69 28	34	2 49 58	57 19	64	4 32 19	30 29
5	26 36	69 21	35	2 54 20	56 37	65	4 34 37	29 22
6	31 54	69 13	36	2 58 39	55 56	66	4 36 47	28 13
7	37 12	69 4	37	3 2 54	55 14	67	4 38 54	27 7
8	42 29	68 54	38	3 7 5	54 30	68	4 40 54	26 1
9	47 44	68 43	39	3 11 12	53 44	69	4 42 50	24 55
10	52 18	68 28	40	3 15 16	52 58	70	4 44 40	23 49
11	58 11	68 11	41	3 19 18	51 26	71	4 46 24	22 42
12	1 3 23	67 52	42	3 23 24	50 57	72	4 48 5	21 34
13	1 8 40	67 35	43	3 27 26	50 48	73	4 49 38	20 24
14	1 13 45	67 17	44	3 30 54	49 46	74	4 51 9	19 14
15	1 18 53	66 55	45	3 34 39	48 54	75	4 52 53	18 3
16	1 24 —	66 38	46	3 38 21	48 —	76	4 53 54	16 51
17	1 29 5	66 18	47	3 41 58	47 5	77	4 55 6	15 38
18	1 34 9	65 57	48	3 45 32	46 9	78	4 56 15	14 25
19	1 39 10	65 36	49	3 48 59	45 13	79	4 57 17	13 14
20	1 44 9	65 14	50	3 52 24	44 19	80	4 58 13	12 3
21	1 49 17	64 50	51	3 55 46	43 27	81	4 59 6	10 53
22	1 54 3	64 24	52	3 59 2	42 32	82	4 59 53	9 41
23	1 58 3	63 56	53	4 2 13	41 37	83	5 — 27	8 34
24	2 3 47	63 24	54	4 5 18	40 41	84	5 1 8	7 14
25	2 8 35	62 53	55	4 8 18	39 44	85	5 1 40	6 2
26	2 13 22	62 22	56	4 11 16	38 47	86	5 2 3	4 51
27	2 18 6	61 48	57	4 14 11	37 50	87	5 2 20	3 40
28	2 22 47	61 13	58	4 17 —	36 51	88	5 2 36	2 37
29	2 27 35	60 35	59	4 19 46	35 48	89	5 2 44	1 44
30	2 32 2	59 56	60	4 22 29	34 48	90	5 2 48	— —

Fig. 3.



Having the true longitude of the ſun and moon, and the place of the node, determined by the methods explained, it is eaſy to judge, from the poſition of the latter, whether at the next conjunction or oppoſition there will be a ſolar, or a lunar, eclipſe; in which caſe the *tit'hi*, or date of the moon's ſynodical month, muſt be computed, from thence to determine the time counted from midnight of her full or change. Her diſtance in longitude from the ſun, divided by 720′, the minutes contained in a *tit'hi*, or the thirtieth part of 360°, the quotient ſhows the *tit'hi* ſhe has paſſed, and the fraction, if any, the part performed of the next, which, if it be the fifteenth, the difference between that fraction and 720′ is the diſtance ſhe has to go to her oppoſition, which will be in time proportioned to her actual motion, and that time being determined, her longitude, the longitude of the ſun, and place of the node may be known for the inſtant of full moon, or middle of the lunar eclipſe. The *Hindu* method of computing theſe particulars is ſo obvious in the accompanying inſtance, as to require no further deſcription here, and the ſame may be ſaid with reſpect to the declination of the ſun, and the latitude of the moon.

It is evident from what has been explained, that the *Pandits*, learned in the *Jyótiſh Sáſtra*, have truer notions of the form of the earth and the economy of the univerſe than are aſcribed to the *Hindus* in general; and that they muſt reject the ridiculous belief of the common *Bráhmens*, that eclipſes are occaſioned by the intervention of the monſter *Ráhu*, with many other particulars equally unſcientifick and abſurd. But, as this belief is founded on explicit and poſitive declarations contained in the *Védas* and *Puránas*, the divine authority of which writings no devout *Hindu* can diſpute, the aſtronomers have ſome of them cautiouſly explained ſuch paſſages in thoſe writings as diſagree with the principles of their own ſcience, and, where reconciliation was impoſſible, have apologized, as well as they could, for propoſitions neceſſarily eſtabliſhed in the practice of it, by obſerving, that certain things, as ſtated in other *Sáſtras*, "might have been ſo formerly and may be "ſo ſtill; but for aſtronomical purpoſes, aſtronomical rules muſt be followed." Others have with a bolder ſpirit attacked and refuted unphiloſophical opinions: BHA'SCARA argues, that it is more reaſonable to ſuppoſe the earth to be ſelf balanced in infinite ſpace, than that it ſhould be ſupported by a ſeries of animals, with nothing aſſignable for the laſt of them to reſt upon; and NERASINHA, in his commentary, ſhows that by *Ráhu* and *Cétu*, the head and tail of the monſter, in the ſenſe they generally bear, could only be meant the poſition of the moon's nodes

and the quantity of her latitude, on which eclipſes do certainly depend; but he does not therefore deny the reality of *Ráhu* and *Cétu*; on the contrary, he ſays, that their actual exiſtence and preſence in eclipſes ought to be believed, and may be maintained, as an article of faith, without any prejudice to aſtronomy. The following *Slóca*, to which a literal tranſlation is annexed, was evidently written by a *Jyótiſh*, and is well known to the *Pandits* in general:

Vip'halányanyaśáſtráni, vivádaſtéſhu cévalam:
Sap'halam jyótiſham śáſtram, chandrárcau yatra śácſhinau.

Fruitleſs *are all* other *Sâſtras*; in them *is* contention only: Fruitful *is* the *Jyótiſh Sáſtra*, where the ſun *and* moon *are* two witneſſes.

The argument of VARA'HA ACHA'RYA concerning the monſter *Ráhu* might here be annexed, but, as this paper will without it be ſufficiently prolix, I ſhall next proceed to ſhow, how the aſtronomical *Pandits* determine the moon's diſtance and diameter, and other requiſites for the prediction of a lunar eclipſe.

The earth they conſider as ſpherical, and imagine its diameter divided into 1600 equal parts, or *Yójanas*. An ancient method of finding a circle's circumference was to multiply the diameter by three; but this being not quite enough, the *Munis* directed that it ſhould be multiplied by the ſquare root of ten. This gives for the equatorial circumference of the earth in round numbers 5059 *Yójanas*, as it is determined in the *Súrya Siddhánta*. In the table of ſines, however, found in the ſame book, the radius being made to conſiſt of 3438 equal parts or minutes, of which equal parts the quadrant contains 5400, implies the knowledge of a much more accurate ratio of the diameter to the circumference; for by the firſt it is as 1. to 3.1627, &c. by the laſt, as 1. to 3.14136; and it is determined by the moſt approved labours of the Europeans, as 1. to 3.14159, &c. In the *Puránas* the circumference of the earth is declared to be 500,000,000 *Yójans*; and, to account for this amazing difference the commentator before quoted thought, "the *Yójan* "ſtated in the *Súrya Siddhánta* contained each 100,000 of thoſe meant in the *Pu*- "*ránas*; or perhaps, as ſome ſuppoſe, the earth was really of that ſize in ſome "former *Calpa*; moreover, others ſay, that from the equator ſouthward the earth "increaſes in bulk: however, for aſtronomical purpoſes, the dimenſions given by "SU'RYA muſt be aſſumed." The equatorial circumference being aſſigned, the circumference of a circle of longitude in any latitude is determined. As radius

3438

3438 is to the *Lambajyà* or ſine of the polar diſtance, equal to the complement of the latitude to ninety degrees, ſo is the equatorial dimenſion 5059, to the dimenſion in *Yójans* required.

Of a variety of methods for finding the latitude of a place, one is by an obſervation of the *palabhà*, or ſhadow projected from a perpendicular *Gnomon* when the ſun is in the equator. The *Sancu* or *Gnomon* is twelve *angulas* or digits in length, divided each into ſixty *vingulas*, and the ſhadow obſerved at *Benares* is $\overset{A}{5}\ \overset{V}{45}$. Then, by the proportion of a right-angled triangle $\sqrt{12.^2+5,45.} = \overset{A}{13}\ \overset{V}{18}$ *acſha-carna* (hypothenuſe) or diſtance from the top of the *Gnomon* to the extremity of the ſhadow; which take as radius, and the projected ſhadow will be the ſine of the zenith diſtance, in this caſe equal to the latitude of the place $\frac{3438' \times 5.45}{\overset{A}{13}\ \overset{V}{18}} = 1487'$, the arc correſponding with which, in the canon of ſines, is 25° 26′, the latitude of *Benares*. The ſine complement of the latitude is 3101′ 57″, and again by trigonometry $\frac{3101'\ 57'' \times 5059\ \overset{Y}{38}}{3438.} = 4565$, 4 *Yógans* the circumference of a circle of longitude in the latitude of *Benares*.

The longitude is directed to be found by obſervation of lunar eclipſes calculated for the firſt meridian, which the *Súrya Siddhánta* deſcribes as paſſing over *Lancá*, *Róhítaca*, *Avanti*, and *Sannihita-ſaras*. *Avanti* is ſaid by the commentator to be "now called *Ujjayini*," or *Ougein*, a place well known to the *Engliſh* in the *Mahratta* dominions. The diſtance of *Benares* from this meridian is ſaid to be ſixty-four *Yójan* eaſtward, and as 4565 *Yójan*, a circle of longitude at *Benares*, is to ſixty *dandas* the natural day, ſo is ſixty-four *Yójan*, to $\overset{Danda}{0}\ \overset{Pala}{50}$, the difference of longitude in time, which marks the time after midnight, when, ſtrictly ſpeaking, the aſtronomical day begins at *Benares* *. A total lunar eclipſe was obſerved to happen at *Benares* fifty-one *palas* later than a calculation gave it for *Lancá*, and $\frac{51+4565\ 4}{60}$ = ſixty-four *Yójana*, the difference of longitude on the earth's ſuface.

According to Rennel's Map, in which may be found *Ougein*, and agreeably to the longitude aſſigned to *Benares*, the equinoctial point *Lancá* falls in the eaſtern

* "This day *(aſtronomical day)* is accounted to begin at midnight under the *réc'hà* (meridian) of *Lancá*; and at "all places eaſt or weſt of that meridian, as much ſooner or later as is their *déſántera* (longitude) reduced to time, "according to the *Súrya Siddhánta*, *Brahma Siddhánta*, *Vaſiſtha Siddhánta*, *Sóma Siddhánta*, *Paráſera Siddhánta*, "and *Aryabhatta*. According to *Brahmagupta* and others, it begins at ſunriſe; according to the *Rómacà* and others "it begins at noon, and according to the *A'rſha Siddhánta* at ſunſet." *(Ticà* on the *Súrya Siddhánta*.)

ocean

ocean ſouthward from *Ceylon* and the *Maldiva* iſlands. *Lancá* is fabuloufly repreſented as one of four cities built by *Dévatás* at equal diſtances from each other, and alſo from *Sumêru* and *Bádawánal*, the north and ſouth poles, whoſe walls are of gold, &c. and with reſpect to MEYA's performing his famous devotions, in reward of which he received the aſtronomical revelations from the ſun recorded in the *Súrya Siddhánta*, the commentator obſerves: " he performed thoſe devotions " in *Sálmala* a country a little to the eaſtward of *Lancá:* the dimenſions of *Lancá* " are equal to one twelfth part of the equatorial circumference of the earth," &c. Hence perhaps on inquiry may be found whether by *Sálmala* is not meant *Ceylon*. In the hiſtory of the war of RA'MA with RA'WAN the tyrant of *Lancá*, the latter is ſaid to have married the daughter of an *Aſura* named MEYA: but theſe diſquiſitions are foreign to my purpoſe.

For the dimenſions of the moon's *cacſhá* (orbit) the rule in the *Sanſcrit* text is more particular, than is neceſſary to be explained to any perſon, who has informed himſelf of the methods uſed by *European* aſtronomers to determine the moon's horizontal parallax. In general terms, it is, to obſerve the moon's altitude, and thence with other requiſites to compute the time of her aſcenſion from the ſenſible *cſhitija*, or horizon, and her diſtance from the ſun when upon the rational horizon, by which to find the time of her paſſage from the one point to the other; or, in other words, 'to find the difference in time between the meridian, to which the 'eye referred her at riſing, and the meridian ſhe was actually upon;' in which difference of time ſhe will have paſſed through a ſpace equal to the earth's ſemidiameter or 800 *Yójan:* and by proportion, as that time is to her periodical month, ſo is 800 *Yójan* to the circumference of her *cacſhá* 324000 *Yójan*. The errors ariſing from refraction, and their taking the moon's motion as along the ſine inſtead of its arc, may here be remarked; but it does not ſeem that they had any idea of the firſt *, and the latter they perhaps thought too inconſiderable to be noticed. Hence it appears, that they made the horizontal parallax 53′ 20″; and her diſtance from the earth's centre 51570 *Yójan*; for $\frac{180^{\circ}+1600}{324000}=53'\ 20''$; and as 90° or 5400′ is to the radius 3438′ ſo is one fourth of her orbit 81000 *Yójan*, to 51570, and $\frac{51570\times 21600}{5059}=220184$, the ſame diſtance in geographical miles. *European* aſtronomers compute the mean diſtance of the moon about 240000, which is ſomething above a

* But they are not wholly ignorant of opticks: they know the angles of *incidence* and *reflection* to be equal, and compute the place of a ſtar or planet, as it would be ſeen reflected from water or a mirror.

fifteenth

fifteenth part more than the *Hindus* found it ſo long ago as the time of MEYA, the author of the *Súrya Siddhánta.*

By the *Hindu* ſyſtem the planets are ſuppoſed to move in their reſpective orbits at the ſame rate; the dimenſions therefore of the moon's orbit being known, thoſe of the other planets are determined, according to their periodical revolutions, by proportion. As the ſun's revolutions in a *Mahá Yug* 4320000 are to the moon's revolutions in the ſame cycle 5753336, ſo is her orbit 324000 *Yójan* to the ſun's orbit 4331500 *Yójan*; and in the ſame manner for the *cacſhás* or orbits of the other planets. All true diſtance and magnitude derivable from parallax is here out of the queſtion; but the *Hindu* hypotheſis will be found to anſwer their purpoſe in determining the duration of eclipſes, &c.

For the diameters of the ſun and moon it is directed, to obſerve the time between the appearance of the limb upon the horizen, and the inſtant of the whole diſc being riſen, when their apparent motion is at a mean rate, or when in three ſigns of anomaly; then, by proportion, as that time is to a natural day, ſo are their orbits to their diameters reſpectively, which of the ſun is 6500 *Yójan*; of the moon, 480 *Yójan.* Theſe dimenſions are increaſed or diminiſhed, as they approach the lower or higher apſis, in proportion as their apparent motion exceeds or falls ſhort of the mean, for the purpoſe of computing the diameter of the earth's ſhadow at the moon, on principles which may perhaps be made more intelligible by a figure.

Let the earth's diameter be *lm=gh=cd*; the diſtance of the moon from the earth AB, and her diameter, CD. By this ſyſtem, which ſuppoſes all the planets moving at the ſame rate, the dimenſions of the ſun's orbit will exceed the moon's, in proportion as his period in time exceeds her's; let his diſtance be AE, and EFG part of his orbit. According to the foregoing computation alſo, the ſun's apparent diameter *fi*, at this diſtance from the earth, is 6500 *Yójan*, or rather, the angle his diameter ſubtends, when viewed in three ſigns of anomaly, would be 6500 parts of the circumference of a circle conſiſting of 4331500, and deſcribed round the earth as a centre with a radius equal to his mean diſtance, which is properly all that is meant by the *viſhcambha*, and which, therefore, is increaſed or diminiſhed according to his equated motion. This in three ſigns of anomaly is equivalent to 32′ 24″; for, as 4331500 to 360°, ſo 6500 to 32′ 24″. The *Europeans* determine the ſame to be 32′ 22″. In the ſame manner, the ſun's *viſhcambha* in the mean *cacſhà* of the moon, or the portion of her orbit in *Yójans*, included in this angle, is found, as 4331500, is to 324000, ſo is 6500 to 486 *Yójan* or *n*, *o*, of uſe in ſolar eclipſes;

eclipſes; but this I am endeavouring to explain is a lunar one. It is evident, that the diameter of the earth's ſhadow at the moon will be $c,d,—c,a,+b,d$, or ab when her diſtance is Ae; and that ca and bd will be found by the following proportion as Ak, is to $fi—gh=fg+hi$, ſo is Ae to $ca+bd$. But it has been obſerved, that Ak and fi are proportioned by the *Hindus* according to the moon's diſtanoe Ae, the apparent motion of the ſun and moon and the angles ſubtended by their diameters. The *Hindu* rule therefore, ſtates: as the ſun's *viſhcambha* or diameter is to the moon's, ſo is the difference of the diameters of the ſun and earth in *Yójan's*, to a fourth number, equal to $ca+bd$ to be ſubtracted from the *ſúchì*, or $lm=cd$ to find ab; alſo, that the number of *Yójans*, thus determined as the diameters of the moon and ſhadow, may be reduced to minutes of a great circle by a diviſor of fifteen. For, as the minutes contained in $360°=21600$, are to the moon's orbit in *Yójan* 324000, ſo is one minute to fifteen *Yójan*.

The diameter of the moon's diſc, of the earth's ſhadow, and the place of the node being found, for the inſtant of oppoſition or full moon, the remaining part of the operation differs in no reſpect, that I know of, from the method of *European* aſtronomers to compute a lunar eclipſe. The tranſlation of the formula for this purpoſe in the *Súrya Siddhánta* is as follows. "The earth's ſhadow is always ſix "ſigns diſtant from *Súrya*, and *Chandra* is eclipſed, whenever at the *purnimà* the "*páta* is found there; as is alſo *Súrya*, whenever at the end of the *amáváſyà* the "*páta* is found in the place of *Súrya*; or, in either caſe, when the *páta* is nearly ſo "ſituated. At the end of the *amáváſyà tit'hi* the ſigns, degrees, and minutes of "*Súrya* and *Chandra* are equal, and at the end of the *purnimà tit'hi* the difference "is exactly ſix ſigns; take therefore the time unexpired of either of thoſe *tit'hi's*, "and the motion for that time add to the *madhyama*, and the degrees and mi-"nutes of *Súrya* and *Chandra* will be equal. For the ſame inſtants of time com-"pute the place of the *páta* in its retrograde motion, and if it ſhould be in conjunc-"tion with *Súrya* and *Chandra*, then, as from the intervention of a cloud, there "will be an obſcurity of *Súrya* or of *Chandra*. *Chandra* from the weſt approaches "the earth's ſhadow, which on entering, he is obſcured. For the inſtant of the "*purnimà*, from the half ſum of the *chandramána* and the *tamóliptamána* ſubtract "the *vicſhépa*, the remainder is the *ch'channa*. If the *ch'channa* is greater * than "the *grahyamána*, the eclipſe will be total, and if leſs, the eclipſe will be propor-

* Or, when the *ch'channa* and *grahyamána* are equal, the eclipſe is *total*.

"tionally

" tionally leſs. The *grahya* and *gráhaca* deduct and alſo add, ſquare the difference " and the ſum ſeverally; ſubtract the ſquare of the *vicſhépa* from each of thoſe " ſquares, and the ſquare root of each remainder multiply by ſixty; divide each " product by the difference of the *gati* of *Súrya* and *Chandra*; the firſt quotient " will be half the duration of the eclipſe in *dandas* and *palas*; and the ſecond quo- " tient will be half the *vimardárdha* duration in *dandas* and *palas*," &c. The *ch'channa*, or portion of the diſc eclipſed, is here found in degrees and minutes of a great circle; it may alſo be eſtimated in *digits*, but the *angulas* or *digits* of the *Hindus* are of various dimenſions in different books.

The beginning, middle, and end of the eclipſe may now be ſuppoſed found for the time in *Hindu* hours, when it will happen after midnight; but, for the correſponding hour of the civil day, which begins at ſunriſe, it is further neceſſary to compute the length of the artificial day and night; and, for this purpoſe, muſt be known the *ayanánſa* or diſtance of the vernal equinox from the firſt of *méſha*, the ſun's right aſcenſion and declination, which ſeveral requiſites ſhall be mentioned in their order.

Reſpecting the preceſſion of the equinoxes and place of the colure, the following is a tranſlation of all I can find on the ſubject in the *Súrya Siddhánta* and its commentary.

Text: " The *ayanánſa* moves eaſtward thirty times twenty in each *Mahá Yug*; " by that number (600) multiply the *ahargana* (number of mean ſolar days for " which the calculation is made) and divide the product by the *ſávan* days in a *Yug*, " and of the quotient take the *bhuja*, which multiply by three, and divide the pro- " duct by ten; the quotient is the *ayanánſa*. With the *ayanánſa* correct the *graha*, " *cránti*, the *ch'háyà*, *charadala*, and other requiſites to find the *puſhti* and the two " *viſhuvas*. When the *carna* is leſs than the *ſúrya ch'háyà*, the *prácchacra* moves " eaſtward, and the *ayanánſa* muſt be added; and when more, it moves weſtward, " and the *ayanánſa* muſt be ſubtracted.

Commentary: " By the text, the *ayana bhagana* is underſtood to conſiſt of 600 " *bhaganas* (periods) in a *Mahá Yug*; but ſome perſons ſay, the meaning is thirty " *bhaganas* only, and accordingly that there are 30000 *bhaganas*. Alſo that BHA'- " SCAR ACHA'RYA obſerves, that, agreeably to what has been delivered by *Súrya*, " there are 30000 *bhaganas* of the *ayanánſa* in a *Calpa*. This is erroneous; for it " diſagrees with the *Sáſtras* of the *Riſhis*. The *Sácalya Sanhità* ſtates that the " *bhaganas* of the *Cránti páta* in a *Mahá Yug* are 600 eaſtward. The ſame is ob-

" ſerved

" ſerved in the *Vaſiſht'ha Siddhánta*, and the rule for determining the *ayanánſa* is as " follows: the expired years divide by 600, of the quotient make the *bhuja*, which " multiply by three, and divide the product by ten. The meaning of BHA'SCAR " ACHA'RYA was not, that SURYA gave 30000 as the *bhaganas* of the *ayanánſa* in " a *Calpa*, the name he uſed being *Saura* not *Súrya*, and applied to ſome other book. " From the *natánſa* is known the *crántyanſa*, and from the *crántijyà* the *bhujajyà*, " the arc of which is the *bhujánſa* of *Súrya*, including the *ayanánſa:* this for the " firſt three months; after which, for the next three months, the place of *Súrya*, " found by this mode of calculation, muſt be deducted from ſix ſigns. For the " next three months the place of *Súrya* muſt be added to ſix ſigns, and for the " laſt three months the place of *Súrya* muſt be deducted from twelve ſigns. Thus " from the ſhadow may be computed the true place of *Súrya*. For the ſame in- " ſtant of time compute his place by the *ahargana*, from which will appear whe- " ther the *ayanánſa* is to be added or ſubtracted. If the place found by the *ahar-* " *gana* be leſs than the place found by the ſhadow, the *ayanánſa* muſt be added. " In the preſent time the *ayanánſa* is added. According to the author of the *Vara-* " *ſanhità*, it was ſaid to have been formerly deducted *; and the ſouthern *ayana* of " *Súrya* to have been in the firſt half of the *nacſhatra Aſléſhá* †; and the northern " *ayana* in the beginning of *Dhaniſhtà:* that in his time the ſouthern *ayana* was in " the beginning of *Carcata*, or Cancer; and the northern in the beginning of *Ma-* " *cara*, or Capricorn.

" The *bhaganas* of the *ayanánſa* in a *Mahá Yug* are 600, the *ſaura* years in the " ſame period 4320000; one *bhagana* of the *ayanánſa* therefore contains 7200 " years. Of a *bhagana* there are four *pádas*. *Firſt páda:* when there was no " *ayanánſa*; but the *ayanánſa* beginning from that time and increaſing, it was add- " ed. It continued increaſing 1800 years; when, it became at its utmoſt or

* " It was ſaid to have been formerly *rina*." In the *Hindu* ſpecious arithmetick, or algebra, *dhana* ſignifies affirmation or addition, and *rina* negation or ſubtraction: the ſign of the latter is a point placed over the figure or the quantity noted down; thus, 4 added to 7, is equal to 3. See the *bija ganita*, where the mode of computation is explained thus: when a man has four pieces of money, and owes ſeven of the ſame value, his circumſtances reduced to the form of an equation or his books balanced, ſhow a deficiency of three pieces.

† This deſcribes the place of the ſolſtitial colure; and according to this account of the *ayanánſa*, the equinoctial colure muſt then have paſſed through the tenth degree of the *nacſhatra Bharaní* and the 3° 20′ of *Viſác hà*. The circumſtance, as it is mentioned in the *Vara Sanhità*, is curious and deſerving of notice. I ſhall only obſerve here, that, although it does not diſagree with the preſent ſyſtem of the *Hindus* in regard to the motion of the equinoctial points, yet the commentator on the *Varaſanhità* ſuppoſes that it muſt have been owing to ſome preternatural cauſe. The place here deſcribed of the colure is on compariſon of the *Hindu* and *European* ſpheres about 3° 40′ eaſtward of the poſition, which it is ſuppoſed by Sir I. NEWTON on the authority of EUDOXUS to have had in the *primitive* ſphere at the time of the Argonautick expedition.

" twenty-

" twenty-ſeven degrees. *Second páda:* after this it diminiſhed; but, the amount " was ſtill added, until, at the end of 1800 years more, it was diminiſhed to no- " thing. *Third páda:* the *ayanánſa* for the next 1800 years was deducted; and " the amount deducted at the end of that term was twenty-ſeven degrees. *Fourth* " *páda:* the amount deduction diminiſhed; and at the end of the next term of " 1800 years, there was nothing either added or ſubtracted. The *Munis*, having " obſerved theſe circumſtances, gave rules accordingly: if in the *ſávan* days of a " *Mahá Yug* there are 600 *bhaganas*, what will be found in the *ahargana* propoſed? " which ſtatement will produce *bhaganas*, ſigns, &c. reject the *bhaganas*, and take " the *bhuja* of the remainder, which multiply by three and divide by ten, becauſe " there are four *pádas* in the *bhagana*; for if in 90°, there is a certain number " found as the *bhuja*, when the *bhuja* degrees are twenty-ſeven, what will be found? " and the numbers twenty-ſeven and ninety uſed in the computation being in the " ratio of three to ten, the latter are uſed to ſave trouble.

" There is another method of computing the *ayanánſa*; the *cránti-pátagati* is " taken at one minute per year; and according to this rule the *ayanánſa* increaſes " to twenty-four degrees; the time neceſſary for which as *one páda* is 1440 years. " This is the *gati* of the *nacſhatras* of the *cránti mandala*.

" The *nacſhatra Révati* riſes, where the *nári mandala* and the *cſhitija* interſect *, " but it has been obſerved to vary twenty-ſeven degrees north and ſouth. The " ſame variation is obſerved in the other *nacſhatras:* it is therefore rightly ſaid, that " the *chacra* moves eaſtward. The *chacra* means all the *nacſhatras*. The planets " are always found in the *nacſhatras*, and the *cránti-páta-gati* is owing to them, not " to the planets; and hence it is obſerved in the text, that the *páta* draws *chandra* " to a diſtance equal to the *cránti* degrees."

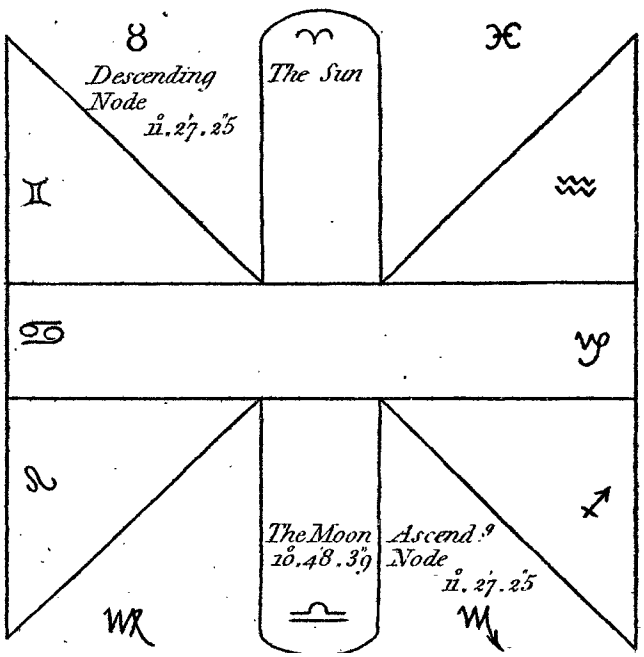
Here, to my apprehenſion, inſtead of a revolution of the equinoxes through all the ſigns in the courſe of the *Platonick* year, which would carry the firſt of *Vaiſác'h* through all the ſeaſons, is clearly implied a liberation of thoſe points from the third degree of *Piſces* to the twenty-ſeventh of *Aries*, and from the third of *Virgo* to the

* This can happen only when there is no *ayanánſa*. The *nári mandala* is the equator. The *yóga* ſtar of *Révati* is in the laſt of *Mína* (Piſces), or, which is the ſame, in the *firſt* of *Méſha* (Aries), and has no latitude in the *Hindu* tables. Hence from the *ayanánſa* and time of the beginning of the *Hindu* year may be known their Zodiacal Stars. *Révati* is the name of the twenty-ſeventh *Lunar* manſion, which comprehends the laſt 13° 20′ of *Mína*. When the *ayanánſa* was 0, as at the creation, the beginning of the *Cali Yug*, &c. the colure paſſed through the *yóga* ſtar of *Révati*. It is plain, that in this paſſage *Révati* applies either to the particular *yóga* ſtar of that name or to the laſt, or twenty-ſeventh, *Lunar* manſion in which it is ſituated. See a former note. In each *nacſhatra*, or planetary manſion, there is *one* ſtar called the *yóga*, whoſe latitude, longitude and right aſcenſion the *Hindus* have determined and inſerted in their aſtronomical tables.

twenty-ſeventh of *Libra*, and back again, in 7200 years; but, as this muſt ſeem to *Europeans* an extraordinary circumſtance to be ſtated in ſo ancient a treatiſe as the *Súrya Siddhánta*, and believed by *Hindu* aſtronomers ever ſince, I hope the above quotations may attract the attention of thoſe who are qualified for a critical examination of them, and be compared with whatever is to be found in other *Sáſtras* on the ſame ſubject. Whatever may be the reſult of ſuch an inveſtigation, there is no miſtaking the rule for determining the *ayanánſa*, which was at the beginning of the preſent year 19° 21′, and conſequently the vernal equinox in *Piſces* 10° 39′, of the *Hindu* ſphere; or, in other words, the ſun entered *Méſha* or *Aries*, and the *Hindu* year began when he was advanced 19° 21′ into the northern ſigns, according to *European* expreſſion.

The *ayanánſa* added to the ſun's longitude in the *Hindu* ſphere, gives his diſtance from the vernal equinox: of the ſun take the *bhuja*, that is, if it exceeds three ſigns, ſubtract it from ſix ſigns, if it exceeds ſix ſigns, ſubtract ſix from it; and if it exceeds nine ſigns, ſubtract it from twelve. The quantity ſo found will be the ſun's diſtance from the neareſt equinoctial point from which is found his declination—as radius is to the *paramápacramajyà*, or ſine of the greateſt declination 24°, ſo is the ſun's diſtance from the neareſt equinoctial point to the declination ſought; which will agree with the table of declination in preſent uſe, to be found in the tables of *Macaranda*, and calculated for the ſeveral degrees of the quadrant. The declination thus determined for one ſign, two ſigns, and three ſigns, is 11° 43′ 20° 38′, and the greateſt declination or the angle of inclination of the ecliptick and equator 24°. The coſines of the ſame in the *Hindu* canon are 3366′, 3217′ and 3141′; and, as the coſine of the declination for one ſign, is to the coſine of the greateſt declination, ſo is the ſign of 30° to the ſign of the right aſcenſion for a point of the ecliptic at that diſtance from either of the two *viſhuvas*, or equinoctial points. In this manner is found the right aſcenſion for the twelve ſigns of the ecliptick reckoned from the vernal equinox; and alſo, by the ſame management of triangles, the aſcenſional difference and oblique aſcenſion for any latitude: which ſeveral particulars are inſerted in the *Hindu* books as in the following table, which is calculated for *Bhágalpur* on ſuppoſition that the *palabhà* or equinoctial ſhadow is $\overset{A}{5}\ \overset{V}{30}$. By the *Lagna* of *Lancà*, *Madhyama*, or mean *Lagna*, the *Hindus* mean thoſe points of the equator which riſe reſpectively with each thirtieth degree of the ecliptick counted from *Aries* in a right ſphere, anſwering to the right aſcenſion

Fig. 4th.


Descending Node
11. 27'. 25"
The Sun
The Moon
20. 48'. 39"
Ascend.g Node
11. 27'. 25"

aſcenſion in any latitude; by the *Lagna* of a particular place, the oblique aſcenſion, or the diviſions of the equator which riſe in ſucceſſion with each ſign in an oblique ſphere, and by the *chara* the aſcenſional difference.

Signs.	Lagna *of* Lancà.		Chara *of* Bhagalpur.		Ullagna.	
Hindu *Names.*	*In reſpirations anſwering to minutes of the equator.*	*In* palas *or minutes of time* 3600 *to a* Nacſhatra *D. y.*	*In reſpirations anſwering to minutes of the equator.*	*In* palas *or minutes of time* 3600 *to a* Nacſhatra *Day.*	*In reſpirations anſwering to minutes of the equator.*	*In* palas *or minutes of time* 3600 *to a* Nacſhatra *Day.*
Méſha,	1670	278	327	55	1343	224
Vriſha,	1795	299	268	45	1527	255
Mit'huna,	1935	323	110	18	1825	304
Carcata,	1935	323	110	18	2045	341
Sinha,	1795	299	268	45	2063	343
Canyà,	1670	278	327	55	1997	333
Tulà,	1670	278	327	55	1997	333
Vriſchica,	1795	299	268	45	2063	343
Dhanus,	1935	323	110	18	2045	341
Macara,	1935	323	110	18	1825	304
Cumbha,	1795	299	268	45	1527	255
Mina,	1670	278	327	55	1343	224
	21600	3600			21600	3600

The COMPUTATION *of the* ECLIPSE.

Let it be premiſed that the poſition of the ſun, moon and nodes, by calculation, will on the firſt of next *Vaiſác'h* be as here repreſented in the *Hindu* manner, excepting the characters of the ſigns.

By inſpection of the figure, and by conſidering the motion of the ſun, moon, and nodes, it appears, that, when the ſun comes to the ſign *Tulà Libra*, correſponding with the month of *Cártic*, the deſcending node will have gone back to *Aries*, and that conſequently a *Lunar* eclipſe may be expected to happen at the end of the *purnimà tit'hi*, or time of full moon, in that month.

FIRST

FIRST OPERATION.

To find the number of mean ſolar days from the creation to ſome part of the *purnimà tit'hi* in *Cártic* of the 4891ſt year of the *Cali Yug*.

Years expired of the *Calpa* to the end of the *Satya Yug*, -	1970784000
Deduct the term of BRAHMA's employment in the creation, -	17064000
From the creation, when the planetary motions began, to the end of the *Satya Yug*, - - - - - - -	1953720000
Add, the *Tréta Yug*, - - - - - - - -	1296000
Dwápar Yug, - - - - - - - -	864000
Preſent year of the *Cali Yug*, - - - - -	4890
From the creation to the next approaching *Bengal* year, -	1955884890
Or Solar months (×12) - - - - - - -	23470618680
Add ſeven months, - - - - - - - - - -	72
	23470618680

As the ſolar months in a *Yug*, 51840000, are to the intercalary *lunar* months in that cycle 1593336, ſo are the ſolar months 23470618687, to their correſponding intercalary *lunar* months 721384677, which added together give 24192003364 lunations. This number multiplied by thirty produces 725760100920 *tit'his* or lunar days, from the creation to the new moon in *Cártic*, to which add fourteen *tit'his* for the ſame, to the *purnimà tit'his* in that month 725760100934. Then, as the number of *tit'his* in a *Yug*, 1603000080, is to their difference exceeding the mean ſolar days in that cycle (called *cſhaya tit'his*) 25082252, ſo are 725760100934 *tit'his* to their exceſs in number over the ſolar days 1135601798 7, which ſubtracted, leaves 714404082947, as the number of mean ſolar days from the creation, or when the planetary motions began, to a point of time which will be midnight under the firſt meridian of *Lancà*, and near the time of full moon in *Cártic* *. The firſt day after the creation being *Ravi-vár*, or *Sunday*, divide the number of days by

* In the year of the *Cali Yug* 4891 correſponding with 1196 *Bengal* ſtyle, and with the month of *October* or *November* (hereafter to be determined) in the year of CHRIST 1789.

ſeven.

ſeven for the day of the week, the remainder after the diviſion being two, marks the day *Sóma-vár*, or *Monday*.

SECOND OPERATION.

For the mean longitude of the ſun, moon, and the aſcending node. Say, as the number of mean ſolar days in a *Maha Yug*, is to the revolutions of any planet in that cycle, ſo are the days from the creation, to even revolutions, which reject, and the fraction if any, turned into ſigns, &c. is the mean longitude required.

1ſt. Of the Sun.

$$\frac{714404082947\times4320000}{1577917828}=(1955884890)$$

Revolutions.	Signs.	°	′	″	‴
	6	22	44	2	12

2d. Of the Moon.

$$\frac{714404082947\times57753336}{1577917828}=(26147888255)\ 0\ 21\ 21\ 58\ 56$$

3d. Of the Moon's Apogee.

$$\frac{714404082947\times488203}{1577917828}=(221034460)\ 11\ 5\ 31\ 13\ 35$$

Correction of the *bíja* add.

$$\frac{714404082947\times4}{1577917828}=(-------)\ 0\ 37\ 37\ 52\ 28$$

11 7 9 6 3

4th. Of the Moon's aſcending Node.

$$\frac{714404082947\times232238}{1577917828}=(105147017)\ 4\ 27\ 49\ 48\ —$$

Correction of the *bíja* add.

$$\frac{714404082947\times4}{1577917828}=(------)\ 0\ 1\ 37\ 52\ 28$$

4 29 27 40 28

5th. Of the Sun's Apogee.

$$\frac{714404082947\times387}{1577917828}=(175----)\ 2\ 17\ 17\ 15\ —$$

Of

	Mean longitude for midnight under the meridian of Lancà.	*Deduct for the longitude of* Bhágalpur *as* *8° 50′ *of the Equator eaſt.*	*Mean longitude for midnight at* Bhágalpur.
Of the Sun,	6s 21° 44′ 2″ 12‴	1′ 27″	6 21 42 35 12
Moon,	— 21 21 58 56	19 34	— 21 2 25 —
Node,	4 29 27 40 28	— 4	4 29 27 36 —
Sun's Apogee,	2 17 17 15 —	inconſiderable	2 17 17 16 —
Moon's Apogee,	11 7 9 6 3	— 9	11 7 8 57 —

THIRD OPERATION.

For the equated longitude of the Sun and Moon, &c.

1ſt. *Of the Sun.*

The mean longitude of the ſun is 6s 21° 42′ 35″ 12‴; of the apogee, 2 17 17 15; the difference. or mean anomaly, 4s 4° 25′ 20″; its complement to 6 ſigns, or diſtance from the perigee, 1s 25° 34′ 40″; the equation for which is required. This may either be taken from the foregoing table tranſlated from *Macaranda*, or calculated in the manner explained as follows:

The ſine of 1s 25° 34′ 40″ is 2835′ 31″ and $\frac{2835' 31'' \times 20'}{3438'} = 14' 30''$ to be ſubtracted from the *paridhi* degrees in *ſama*; 14°—14′ 30″ = 13° 53′ 30″, the circumference of the epicycle in this point of anomaly; and $\frac{13^{n} 43' 30'' \times 2835' 31''}{3^{n}0^{0}} = 108' 61''$ the ſine of the angle of equation, conſidered as equal to its arc, or 1° 48′ 6″, to be deducted from the mean, for the true longitude; 6s 21° 42′ 35″—1° 48′ 6″=6s 19° 54′ 29″ for midnight agreeing with mean time; but as, in this point of anomaly, the true or apparent midnight precedes that eſtimated for mean time, for which the computation has been made, a proportionable quantity muſt be deducted from the ſun's place, which is thus found. Say, as the minutes contained in the ecliptick are to the ſun's mean motion in one day 59′ 8″, ſo is the equation of his mean to his true place 180′ 6″, to the equation of time required, 0′ 18″ $(= \frac{59' 8'' \times 108' 6''}{21600})$ and 6s 19° 54′ 29″—18″=6s 19° 54′ 11″ the ſun's true longitude for the apparent midnight.

For the ſun's true motion. The coſine of the ſun's diſtance from the perigee is

* This longitude aſſigned to *Bhágalpur* is erroneous; but the error does not in the leaſt affect the main object of the Paper.

1941′

1941′ 0″ 1‴, and $\frac{1941' 0'' 1''' \times 13\ 43\ 30}{360^{\circ}} = 74'$ the cosine of the epicycle, and $\frac{59' 8'' \times 74}{3438} = 1' 16'$ equation, to be added to the mean for the true motion $59' 8'' \times 1' 16'' = 60' 24''$ per day, or 60″ 24‴ per *danda*.

2d. *Of the Moon.*

The moon's mean longitude for the mean midnight is 0*s* 21° 2′ 25″, which exceeds her mean longitude for the true midnight, but $\frac{108 \times 790\ 1\ 35}{21600} = 3' 57''$ her motion in the difference of time between the mean and true midnight 0*s* 21° 2′ 25″—3′ 57″=0 20 58 28 mean longitude, for which the anomaliſtick equation is to be found. Place of the apogee 11*s* 7° 8′ 55″, and the moon's diſtance from it 1*s* 13° 49′ 33″. The ſine of the latter, 2379′ 39″. By the rule before explained $\frac{2379' 39' \times 20'}{3438} = 13' 51''$ and $\frac{32^{\circ} - 13' 51'' \times 2379' 39''}{360} = 210'$, the ſine of the angle of equation equal to its arc, or 3° 30″, to be ſubtracted, 0° 20′ 58″ 28‴—3° 30″=0° 17′ 28″ 28‴ the moon's true place, agreeing with the true or apparent midnight.

For the moon's true motion. The coſine of her diſtance from the apogee 2479. 13. Circumference of the epicycle 31° 46′ 9″, and $\frac{31^{\circ} 46' 9'' \times 2479' 13''}{360^{\circ}} = 218' 47$ coſine in the epicycle. The moon's mean motion from her apogee is 790′ 35″—6′ 41″=783′ 54″, and $\frac{783' 54'' \times 218' 47''}{3438} = 49' 53''$ the equation of her mean to her true motion, to be ſubtracted, 790. 35—49. 53=740. 42 the moon's true motion per day, or 740″ 42‴ per *danda*.

For the place of the moon's apogee reduced to the apparent midnight. The motion of the apogee is 6′ 41″ per day. $\frac{108' 6'' \times 6' 41''}{21600''} = 2''$, 11*s* 7° 8′ 57″—2″=11*s* 7° 8′ 55″ its place.

For the ſame of the node. Its motion per day is 3′ 11″, and $\frac{108' 6'' \times 3' 11''}{21600''} = 1''$, and 4*s* 29° 27′ 36″—1″=4*s* 29° 27′ 35″ its place.

The true longitude and motion, therefore, for the apparent time of midnight at *Bhágalpur*, 714404082947 ſolar days after the creation, or commencement of the planetary motions, will be

	Longitude.				*Motion per Day.*	
	s	°	′	″	′	″
Of the Sun,	6	19	54	11	60	24
Moon,	—	17	28	28	740	42
Sun's Apogee,	2	17	17	15	inconſiderable	
Moon's Apogee,	11	7	8	55	6	41
Moon's Node,	4	29	27	35	3	11

FOURTH

FOURTH OPERATION.

Having the longitude and motion as above, to determine the *tit'hi* and time remaining unexpired to the inſtant of oppoſition or full moon.

The moon's longitude ſubtracted from the ſun's leaves 5*s* 27° 34′ 17″, or 10654′ 17″, which divided by 720′ the minutes in a mean *tit'hi* quotes fourteen even *tit'hi's* expired, and the fraction, or remainder 574′ 17″, is the portion expired of the 15th or *purnimà tit'hi*, which ſubtracted from 720′ leaves 145′ 43″ remaining unexpired of the ſame; which, divided by the moon's motion per *danda* from the ſun, will give the time remaining unexpired from midnight to the inſtant of full moon with as much preciſion as the *Hindu* aſtronomy requires. Deduct the ſun's motion 60″ 24‴ per *danda* from the moon's 740″ 42‴, the remainder 680″ 8‴, is the moon's motion from the ſun; by this divide the part remaining unexpired of the *purnimà tit'hi* 145′ 43″.

$$\frac{145' 43'' = 524580'''}{680'' 8''' = 40818'''} \begin{matrix} D. & P. \\ = 12 & 51 \end{matrix}$$

therefore, 12 *dandas* 51 *palas* after midnight will be the end of the *purnimà tit'hi* or inſtant of oppoſition of the ſun and moon.

FIFTH OPERATION.

Having the inſtant of oppoſition as above, to find the true longitude and motion of the ſun and moon, the latitude of the latter, and the place of the node.

Add the mean motion of each for $\begin{matrix} D. & P. \\ 12 & 51 \end{matrix}$ to the mean place, found before for the true midnight; and for the mean places ſo found, compute again the anomaliſtick equations. This being but a repetition of operation, the third is unneceſſary to be detailed. Theſe ſeveral particulars are as follows:

	Mean longitude for midnight.	*Mean longitude at full Moon.*	*Equation.*	*True longitude at full moon.*
Of the Sun,	6*s* 21° 42′ 17″	6*s* 21° 54′ 17″	1° 47′ 50″	6*s* 20° 7′ 7″
Moon,	— 20 58 28	— 23 47 47	3 40 20	— 20 7 27
Moon's Apogee,	11 7 8 55	11 7 10 21		
Moon's Node.	4 29 27 35	4 29 28 16		

	Mean motion.	*Equation.*	*True motion at full moon.*
Of the Sun,	59′ 8″	× 1′ 16″	60′ 24″
Moon,	790 35	— 47 28	743 7

Hence

Hence it appears, that at the oppoſition the moon will be near her deſcending node; for, $4s\ 29^\circ\ 28'\ 16'' + 6s = 10s\ 29^\circ\ 28'\ 16''$, the place of the deſcending node *in antecedentia*, and $12s - 10s\ 29^\circ\ 28'\ 16'' = 1s\ 0^\circ\ 31'\ 44''$ its longitude according to the order of the ſigns, and $1s\ 0^\circ\ 31'\ 44'' - 20^\circ\ 7'\ 27'' = 10^\circ\ 24'\ 17''$ the moon's diſtance from her deſcending node, which, being within the limit of a lunar eclipſe, ſhews that the moon will be then eclipſed. For her latitude at this time, ſay, as radius, is to the inclination of her orbit to the ecliptick, $4^\circ\ 30'$ or $270''$, ſo is the ſine of her diſtance from the node $620'\ 57''$; to her latitude $48'\ 45''$ $\left(=\frac{279''+620'\ 57''}{3438'}\right)$.

SIXTH OPERATION.

From the elements now found, to compute the diameters of the moon and ſhadow, and the duration of the eclipſe.

	Yójan.	
The Sun's mean diameter is - - - - - -	6500	
Moon's - - - - - - - - -	480	
Earth's - - - - - - - - -	1600	
Sun's mean motion, - - - - - - -	59′	8″
Moon's - - - - - - - - -	790	35
Sun's true motion, - - - - - - -	60	24
Moon's - - - - - - - - -	743	7
Moon's latitude, - - - - - - -	48	45

As the moon's mean motion is to her mean diameter, ſo is her true motion to her true diameter for the time of oppoſition $\frac{743'\ 7'' \times \overset{Y}{480}}{790,\ 35} = 451\ 11$ *Yójan*, which divided by fifteen quotes $30'\ 5''$ of a great circle.

As the ſun's mean motion is to his mean diameter, ſo is his true motion to his diameter at the inſtant of oppoſition $\frac{60'\ 24'' \times \overset{Y}{6500}}{59'\ 8''} = 6639\ 14$ *Yójan*.

As the moon's mean motion is the earth's diameter, ſo is the moon's equated motion to the *Súchì*, or a fourth number, which muſt be taken as the earth s diameter, for the purpoſe of proportioning its ſhadow to the moon's diſtance and apparent diameter $\frac{160 \times 743'\ 7'}{790'\ 35''} = 1503\ 56$ *Yójan*, the *Súchì*.

Equated diameter of the ſun,	6639 14
Of the Earth,	1503 56
Difference,	5039 14

As the ſun's mean diameter is to the moon's mean diameter, ſo is the difference above 5039 14, to a fourth number, which deducted from the *Súchì*, or equated diameter of the earth, leaves the diameter of the earth's ſhadow at the moon, $\frac{480^r \times 5039'\ 14''^r}{6500} = 372'.\ 7''$, and $1503'.\ 56'' - 372'.\ 7'' = 1131'$, 49 *Yójan*, which divided by fifteen quotes $75'\ 27''$ of a great circle, for the ſame.

From the half ſum of the diameters of the moon and ſhadow $\frac{75'\ 27'' \times 30'\ 5''}{2} = 52'\ 46''$, ſubtract the moon's latitude $48'\ 45''$, the remainder is the *Chch'anna*, or portion of the moon's diameter eclipſed, $4'\ 1''$ of a great circle, and by the nature of a right angled triangle, the ſquare root of the difference of the ſquares of the moon's latitude, and the half ſum of the diameters of the ſhadow and moon, will be the path of the moon's centre, from the beginning to the middle of the eclipſe.

The diameter of the ſhadow is,	75 27
Of the moon, - - -	30 5
Sum, -	105 32
Half ſum, -	52 46
The moon's latitude is, - -	48 45

$\sqrt{52.\overline{46^2 + 48.45^2}} = 20'\ 11''$ which, divided by the moon's motion from the ſun, quotes the half duration of the eclipſe, in *dandas* and *palas*, or *Hindu* mean ſolar hours, $\frac{20'\ 11'' = 1211'''}{682'' \quad 43''}$ D P V = 1 46 25, which doubled is 3 32 50, the whole duration of the eclipſe; which will be partial, the moon's latitude being greater than the difference between the ſemidiameters of the moon's diſc and the earth's ſhadow.

SEVENTH

SEVENTH OPERATION.

To find the position of the equinoctial colures, and thence the declination of the sun, the length of day and night, and the time counted from sunrise, or hour of the civil day when the eclipse will happen.

1*st*. For the *ayanánsa* or distance of the vernal equinox from the 1st of *Mesha*. $\frac{714404082947 \times 600}{1577917828} = (\overset{\text{Periods}}{271650})\ 8s\ 4^\circ\ 31'\ 30''\ 52'''$ of which take the *bhuja* $8s\ 4^\circ\ 31'\ 30''\ 52''' - 6s = 2s\ 4^\circ\ 31'\ 30''\ 52'''$ which multiply by three, and divide by ten, $\frac{64^\circ\ 31'\ 30\ 52 \times 3}{10} = 19^\circ\ 21'\ 27''$ the *ayanánsa*, which in the present age is added to the sun's longitude, to find his distance from the vernal equinox. The sun's equated longitude is $6s\ 19^\circ\ 54'\ 11''$, and $6s\ 19^\circ\ 54'\ 11'' \times 19^\circ\ 21'\ 27'' = 7s\ 9^\circ\ 15'\ 38''$ his distance from the vernal equinox.

2*d*. For the declination, right ascension, and ascensional difference. The sun's place is $7s\ 9^\circ\ 15'\ 38''$, and $1s\ 9^\circ\ 15'\ 38''$ his distance from the autumnal equinox; the sine of which is $2174'\ 41''$, and as radius is to the sine of the greatest declination 24°, termed the *paramápacramajyà* $1397'$, so is $2174.\ 41$ to the sine of his declination $883'\ 40''$, the arc corresponding with which, in the canon of sines, is $14^\circ\ 53'$, $(\frac{1397' \times 2174'\ 41'}{3438} = 883'\ 40'')$. The equinoctial shadow at *Bhágalpur* is $\overset{A}{5},\ \overset{V}{30}$ and, as the *Gnomon* of twelve *angalas* is to the equinoctial shadow, so is the sine of the declination $883.\ 40$, to the *cshitijyà*, $\frac{\overset{A}{5}\ \overset{V}{30} \times 883'\ 40''}{3438} = 405'\ 1''$. And as the cosine of the declination is to radius, so is the *cshitijyà*, to the sine of the *chara* or ascensional difference $\frac{405\ 1 \times 3438}{3322.\ 36} = 419'\ 4''$, its arc is $419'\ 56''$ the ascensional difference.

3*d*. For the length of the day and night.

The modern *Hindus* make their computations in mean solar time; the *Súrya Siddhánta* directs, that they be made in sydereal time. A sydereal day contains sixty *dandas*; each *dandas*, sixty *viculas*; and each *vicula* six respirations, in all 21600 respirations answering to the minutes of the equator. A *nacshatra* day is exceeded in length by the *sávan* or solar day, by reason of the sun's proper motion in the ecliptick, the former measures time equably, but the latter varies in its length from the inequality of the sun's motion, and the obliquity of the ecliptick. The sun's equated motion for the middle of the eclipse was found $60'\ 24''$; and the oblique ascension for the eighth sign from the vernal equinox, in which he will be found at that time, is taken from the foregoing table 343 *palas* or 2058 respirations.

As

As the number of the minutes contained in one ſign 1800, is the number of reſpirations, or the arc of the equator in minutes anſwering to the oblique aſcenſion of the ſign the ſun is in 2058, as above, ſo is the equated motion 60′ 24″, to the exceſs in reſpirations of the *ſávan* or ſolar day over the *nacſhatra* or ſydereal day $\frac{2058' \times 60' 24''}{1800} = 69' 3''$, which added to 21600′ gives the length of the ſolar day by civil account from ſunriſe to ſunriſe, ſydereal time 21669. 3 reſpirations. From one fourth of this deduct the aſcenſional difference, the ſun being declined towards the ſouth pole, for the ſemidiurnal arc; and add it for the ſeminocturnal arc. The former is 4997′ 19″ and the latter 5837′ 11″; which may be reduced to *dandas* or *Hindu* hours by a diviſion of 360. Hence half the day is $^{D}13\ ^{P}52\ ^{V}53$, and half the night $^{D}16\ ^{P}12\ ^{V}52$. The whole day added to half the night ſhows the hour counted from the preceding ſunriſe to midnight $^{D}43\ ^{P}58\ ^{V}38$, to which add the time at midnight unexpired of the *purnimà tit'hi*, for the hour of the civil day correſponding with the middle of the eclipſe. The hour from midnight to the end of the *purnimà tit'hi* is already found $^{D}12\ ^{P}51$ in mean ſolar time, and to reduce it to ſydereal time, ſay, as 21600′ is to 21600′ × 59′ 8″, ſo is $^{D}12\ ^{P}51$, to ſidereal hours $^{D}12\ ^{P}53$, equal to $^{D}12\ ^{P}51$ ſolar hours.

	D	P	V
From the preceding ſunriſe to midnight is,	43	59	—
At midnight will remain of the *purnimà tit'hi*	12	53	—
Hour of the civil day at the middle of the eclipſe,	56	52	—
Deduct the half duration,	1	46	25
Beginning of the eclipſe,	55	5	35
Add the whole duration,	3	32	50
End of the eclipſe,	58	38	25

And the day and night containing together $^{D}60\ ^{P}11\ ^{V}30$, the eclipſe ſhould end $^{D}1\ ^{P}33\ ^{V}5$ before ſunriſe according to this calculation.

The firſt day after the creation according to the *Hindus* was *ravi-vár* or *Sunday*: the number of days, for which the above calculation has been made, is 7144040829 47, which divided by ſeven, the number of days in a week are 1205772613 5 weeks and two days; the aſtronomical day therefore of *ſoma-vár* or *Monday*, will end at midnight

midnight preceding the eclipſe; but the *ſoma-vár* by civil computation will continue to the next enſuing ſunriſe, and this *ſoma-vár* by calculating the number of days elapſed from the inſtant the ſun entered the ſign *Tulà*, to his advance of 19° 54′ on that ſign, will be found to fall on the 19th of the month of *Cártic*, anſwering to the 3d of November.

The time of full moon and the duration of the eclipſe, found by this computation differ conſiderably from the Nautical Almanack. The *Siddhánta Rahaſya* and *Grahalághava*, comparatively modern treatiſes, are nearer the truth, yet far from correct. The *Hindus*, in determining theſe phenomena, are ſatisfied when within a few minutes of the true time.

A comparative ſtatement of this eclipſe as predicted in the Nautical Almanack with computations of it made by different *Hindu* books. Thoſe marked * are made for different meridians, the laſt I believe for *Tirhùt*.

NAMES.	Equated longitude for midnight at *Bhágalpur*, ſuppoſed in 8° 50′ E. from *Lancà*, and 88° E. from *Greenwich*.		
	The Sun.	*The Moon.*	*The Node.*
	S. ° ′ ″	S. ° ′ ″	S. ° ′ ″
Súrya Siddhánta,	6 19 54 11	— 17 28 28	1 — 31 44
Tables of Macaranda,	6 19 55 9	— 17 30 9	1 — 32 7
* Grahalághava,			
Siddhánta Rahaſya,	6 19 54 29	— 17 16 25	1 — 27 35
	Add to each the *ayanánſa* 19° 21′ 27″ for the longitude counted according to *European* Aſtronomers from the Equinoctial colure.		
	S. ° ′ ″	S. ° ″ ′	S ° ′ ″
Súrya Siddhánta,	7 9 15 38	1 6 49 55	1 19 53 11
Tables of Macaranda,	7 9 16 36	1 6 51 36	1 19 53 54
* Grahalághava,			
Siddhánta Rahaſya,	7 9 15 56	1 6 37 52	1 19 49 2
Nautical Almanack,	7 10 47 8	1 7 50 58	1 19 45 30

	From midnight to the middle of the Eclipſe.		Duration of the Eclipſe.	
	Hindu time.	*Engliſh time.*	*Hindu time.*	*Engliſh time.*
	D. P. V.	H. M. S.	D P. V.	H M. S
Súrya Siddhánta,	12 53 —	5 9 12	3 12 50	1 17 8
Tables of Macaranda,			4 50 —	1 46 20
* Grahalághava,	*14 50 —	5 56 —	5 18 —	1 56 36
Siddhánta Rahaſya,	13 53 —	5 33 —	4 58 —	1 49 16
* Grahana Malá, a Catalogue of Eclipſes,	16 6 —	6 26 24	5 26 —	2 10 24
Nautical Almanack,	16 — 37	6 24 15	5 22 2½	2 9 —

XVI.

XVI.

ON THE ANTIQUITY OF INDIAN ZODIAC.—*See the Works of Sir William Jones, Vol. I. p. 333.*

XVII.

AN ACCOUNT OF THE KINGDOM OF NEPAL, BY FATHER GIUSEPPE, PREFECT OF THE ROMAN MISSION.

Communicated by JOHN SHORE, *Esq.*

THE kingdom of *Népál* is ſituated to the north eaſt of *Patna* at the diſtance of ten or eleven days' journey from that city. The common road to it lies through the kingdom of *Macwanpur*; but the miſſionaries and many other perſons enter it on the *Bettia* quarter. Within the diſtance of four days' journey from *Népál* the road is good in the plains of *Hinduſtàn*, but in the mountains it is bad, narrow, and dangerous. At the foot of the hills the country is called *Teriáni:* and there the air is very unwholeſome from the middle of *March* to the middle of *November*; and people in their paſſage catch a diſorder called, in the language of that country, *Aul*, which is a putrid fever, and of which the generality of people, who are attacked with it, die in a few days; but on the plains there is no apprehenſion of it. Although the road be very narrow and inconvenient for three or four days at the paſſes of the hills, where it is neceſſary to croſs and recroſs the river more than fifty times, yet, on reaching the interior mountain before you deſcend, you have an agreeable proſpect of the extenſive plain of *Népál*, reſembling an amphitheatre covered with populous towns and villages: the circumference of the plain is about 200 miles, a little irregular, and ſurrounded by hills on all ſides, ſo that no perſon can enter or come out of it without paſſing the mountains.

There are three principal cities in the plain, each of which was the capital of an independent kingdom; the principal city of the three is ſituated to the northward of the plain, and is called *Cat'hmándú:* it contains about 18,000 houſes; and this kingdom from ſouth to north extends to the diſtance of twelve or thirteen days' journey as far as the borders of *Tibet*, and is almoſt as extenſive from eaſt to weſt. The king of *Cat'hmándú* has always about 50,000 ſoldiers in his ſervice. The ſecond

city

city to the ſouth weſt of *Cat'hmándú* is called *Lelit Pattan*, where I reſided about four years; it contains near 24,006 houſes; the ſouthern boundary of this kingdom is at the diſtance of four days' journey, bordering on the kingdom of *Macwanpur*. The third principal city to the eaſt of *Lelit Pattan* is called *B'hátgán*; it contains about 12,000 families, extends towards the eaſt to the diſtance of five or ſix days' journey, and borders upon another nation, alſo independent, called *Cirátas*, who profeſs no religion. Beſides theſe three principal cities, there are many other large and leſs conſiderable towns or fortreſſes, one of which is *Timi* and another *Cipoh*, each of which contains about 8,000 houſes, and is very populous: all thoſe towns both great and ſmall are well built; the houſes are conſtructed of brick, and are three or four ſtories high; their apartments are not lofty; they have doors and windows of wood well worked and arranged with great regularity. The ſtreets of all their towns are paved with brick or ſtone, with a regular declivity to carry off the water. In almoſt every ſtreet of the capital towns there are alſo good wells made of ſtone, from which the water paſſes through ſeveral ſtone canals for the public benefit. In every town there are large ſquare varandas well built, for the accommodation of travellers and the publick: theſe varandas are called *Pali*, and there are alſo many of them as well as wells in different parts of the country for publick uſe. There are alſo, on the outſide of the great towns, ſmall ſquare reſervoirs of water faced with brick, with a good road to walk upon, and a large flight of ſteps for the convenience of thoſe who chooſe to bathe. A piece of water of this kind on the outſide of the city of *Cat'hmándú* was at leaſt 200 feet long on each ſide of the ſquare, and every part of its workmanſhip had a good appearance.

The religion of *Népál* is of two kinds: the more ancient is profeſſed by many people who call themſelves *Baryeſu*; they pluck out all the hair from their heads; their dreſs is of coarſe red woollen cloth, and they wear a cap of the ſame: they are conſidered as people of the religious order, and their religion prohibits them from marrying, as it is with the *Lamas* of *Tibet*, from which country their religion was originally brought; but in *Népál* they do not obſerve this rule, except at their diſcretion; they have large monaſteries, in which every one has a ſeparate apartment or place of abode; they obſerve alſo particular feſtivals, the principal of which is called *Yátrà* in their language, and continues a month or longer according to the pleaſure of the king. The ceremony conſiſts in drawing an idol, which at *Lelit Pattan* is called BAGHERO*, in a large and richly ornamented car, covered with gilt

* I ſuppoſe the name of *Bhagavat* or *Criſhna*; but *Bhárga* is *Mahadéva*, and *Bajri* or *Vajri* means the *Thunderer*.

copper:

copper: round about the idol ſtand the king and the principal *Baryeſus*; and in this manner the vehicle is almoſt every day drawn through ſome one of the ſtreets of the city by the inhabitants, who run about beating and playing upon every kind of inſtrument their country affords, which make an inconceivable noiſe.

The other religion, the more common of the two, is that of the *Bráhmens*, and is the ſame as is followed in *Hinduſtàn*, with the difference that in the latter country the *Hindus* being mixed with the *Mohammedans*, their religion alſo abounds with many prejudices, and is not ſtrictly obſerved, whereas in *Népál*, where there are no *Muſelmans* (except one *Caſhmirian* merchant) the *Hindu* religion is practiſed in its greateſt purity: every day of the month they claſs under its proper name, when certain ſacrifices are to be performed, and certain prayers offered up in their temples: the places of worſhip are more in number in their towns than, I believe, are to be found in the moſt populous and moſt flouriſhing cities of *Chriſtendom*; many of them are magnificient according to their ideas of architecture, and conſtructed at a very conſiderable expence; ſome of them have four or five ſquare cupolas, and in ſome of the temples two or three of the extreme cupolas, as well as the doors and windows of them, are decorated with gilt copper.

In the city of *Lelit Pattan* the temple of BAGHERO was contiguous to my habitation, and was more valuable, on account of the gold, ſilver and jewels it contained, than even the houſe of the king: beſides the large temples there are alſo many ſmall ones, which have ſtairs, by which a ſingle perſon may aſcend, on the outſide all around them; and ſome of thoſe ſmall temples have four ſides, others ſix, with ſmall ſtone or marble pillars poliſhed very ſmooth, with two or three pyramidal ſtories, and all their ornaments well gilt, and neatly worked according to their ideas of taſte: and I think, that, if *Europeans* ſhould ever go into *Népál*, they might take ſome models from thoſe little temples, eſpecially from the two which are in the great court of *Lelit Pattan*, before the royal palace: on the outſide of ſome of their temples there are alſo great ſquare pillars or ſingle ſtones from twenty to thirty feet high, upon which they place their idols ſuperbly gilt. The greateſt number of their temples have a good ſtone ſtaircaſe in the middle of the four ſquares, and, at the end of each flight of ſtairs, there are lines cut out of ſtone on both ſides: around about their temples there are alſo bells, which the people ring on particular occaſions; and when they are at prayers, many cupolas are alſo quite filled with little bells hanging with cords in the inſide about the diſtance of a foot from each other, which make a great noiſe on the quarter where the wind conveys the ſound.

There

There are not only ſuperb temples in their great cities but alſo within their caſtles.

To the eaſtward of *Cat'hmándú* at the diſtance of about two or three miles there is a place called *Tolu*, by which there flows a ſmall river, the water of which is eſteemed holy according to their ſuperſtitious ideas, and thither they carry people of high rank, when they are thought to be at the point of death: at this place there is a temple, which is not inferiour to the beſt and richeſt in any of the capital cities. They alſo have it on tradition, that, at two or three places in *Népál*, valuable treaſures are concealed under ground: one of thoſe places they believe is *Tolu*, but no one is permitted to make uſe of them except the king, and that only in caſes of neceſſity. Thoſe treaſures, they ſay, have been accumulated in this manner: when any temple had become very rich from the offerings of the people, it was deſtroyed, and deep vaults dug under ground one above another, in which the gold, ſilver, gilt copper, jewels, and every thing of value were depoſited. When I was in *Népál*, GAINPREJAS, king of *Cat'hmándú*, being in the utmoſt diſtreſs for money to pay his troops, in order to ſupport himſelf againſt PRIT'HWI'NA'RA'YAN, ordered ſearch to be made for the treaſures of *Tolu*; and, having dug to a conſiderable depth under ground, they came to the firſt vault, from which his people took to the value of a lac of rupees in gilt copper, with which GAINPREJAS paid his troops, excluſive of a number of ſmall figures in gold or gilt copper, which the people who had made the ſearch had privately carried off: and this I know very well; becauſe one evening as I was walking in the country alone, a poor man, whom I met on the road, made me an offer of a figure of an idol in gold or copper gilt, which might be five or ſix ſicca weight, and which he cautiouſly preſerved under his arm, but I declined accepting it. The people of GAINPREJAS had not completely emptied the firſt vault, when the army of PRIT'HWI'NA'RA'YAN arrived at *Tolu*, poſſeſſed themſelves of the place where the treaſure was depoſited, and cloſed the door of the vault, having firſt replaced all the copper there had been on the outſide.

To the weſtward alſo of the great city of *Lelit Pattan* at the diſtance of only three miles, is a caſtle called *Banga*, in which there is a magnificent temple: no one of the miſſionaries ever entered into this caſtle, becauſe the people who have the care of it, have ſuch a ſcrupulous veneration for this temple, that no perſon is permitted to enter it with ſhoes on; and the miſſionaries, unwilling to ſhew ſuch reſpect to their falſe deities, never entered it. But when I was at *Népál*, this caſtle

being in the poſſeſſion of the people of *Górc'há*, the commandant of the caſtle and of the two forts which border on the road, being a friend of the miſſionaries, gave me an invitation to his houſe, as he had occaſion for a little phyſick for himſelf and ſome of his people: I then, under the protection of the commandant, entered the caſtle ſeveral times, and the people durſt not oblige me to take off my ſhoes. One day, when I was at the commandant's houſe, he had occaſion to go into the varanda, which is at the bottom of the great court facing the temple, where all the chiefs dependent upon his orders were aſſembled, and where alſo was collected the wealth of the temple; and, wiſhing to ſpeak to me before I went away, he called me into the varanda. From this incident I obtained a ſight of the temple, and then paſſed by the great court which was in front: it is entirely marble almoſt blue, but interſperſed with large flowers of bronze well diſpoſed to form the pavement of the great court yard, the magnificence of which aſtoniſhed me, and I do not believe there is another equal to it in *Europe*.

Beſides the magnificence of the temples, which their cities and towns contain, there are many other rarities. At *Cat'hmándú* on one ſide of the royal garden there is a large fountain, in which is one of their idols called *Nárayan*. This idol is of blue ſtone, crowned and ſleeping on a mattreſs alſo of the ſame kind of ſtone, and the idol and the mattreſs appear as floating upon the water. This ſtone machine is very large: and I believe it to be eighteen or twenty feet long and broad in proportion, but well worked and in good repair.

In a wall of the royal palace of *Cat'hmándú*, which is built upon the court before the palace, there is a great ſtone of a ſingle piece, which is about fifteen feet long, and four or five feet thick; on the top of this great ſtone, there are four ſquare holes at equal diſtances from each other: in the inſide of the wall they pour water into the holes, and in the court ſide, each hole having a cloſed canal, every perſon may draw water to drink: at the foot of the ſtone is a large ladder, by which people aſcend to drink; but the curioſity of the ſtone conſiſts in its being quite covered with characters of different languages cut upon it. Some lines contain the characters of the language of the country; others the characters of *Tibet*; others *Perſian*; others *Greek*, beſides ſeveral others of different nations; and in the middle there is a line of *Roman* characters; which appears in this form AVTOMNEW INTER LHIVERT; but none of the inhabitants have any knowledge how they came there, nor do they know whether or not any *European* had ever been in *Népál* before

before the miſſionaries, who arrived there only the beginning of the preſent century. They are manifeſtly two *French* names of ſeaſons, with an Engliſh word between them.

There is alſo to the northward of the city of *Cat'hmándú* a hill called *Simbi*, upon which are ſome tombs of the *Lamas* of *Tibet*, and other people of high rank of the ſame nation: the monuments are conſtructed after various forms; two or three of them are pyramidal, very high and well ornamented; ſo that they have a very good appearance, and may be ſeen at a conſiderable diſtance; round theſe monuments are remarkable ſtones covered with characters, which probably are the inſcriptions of ſome of the inhabitants of *Tibet*, whoſe bones were interred there. The natives of *Népál* not only look upon the hill as ſacred, but imagine it is protected by their idols! and from this erroneous ſuppoſition, never thought of ſtationing troops there for the defence of it, although it be a poſt of great importance, and only at a ſhort mile's diſtance from the city: but during the time of hoſtilities a party of PRIT'HWI'NA'RA'YAN's troops being purſued by thoſe of GAINPREJAS, the former, to ſave themſelves, fled to this hill, and, apprehending no danger from its guardian idols, they poſſeſſed themſelves of it and erected a fortification (in their own ſtyle) to defend themſelves: in digging the ditches round the fort, which were adjoining to the tombs, they found conſiderable pieces of gold, with a quantity of which metal the corpſes of the grandees of *Tibet* are always interred, and when the war was ended, I myſelf went to ſee the monuments upon the hills.

I believe that the kingdom of *Népál* is very ancient, becauſe it has always preſerved its peculiar language and independence; but the cauſe of its ruin is the diſſention which ſubſiſts among the three kings. After the death of their ſovereign the nobles of *Lelit Pattan* nominated for their king GAINPREJAS, a man poſſeſſed of the greateſt influence in *Népál*; but ſome years afterwards they removed him from his government, and conferred it upon the king of *Bh'atgán*; but he alſo a ſhort time afterwards was depoſed; and, after having put to death another king who ſucceeded him, they made an offer of the government to PRIT'HWI'NA'RA'YAN, who had already commenced war. PRIT'HWI'NA'RA'YAN deputed one of his brothers, by name DELMERDEN SA'H, to govern the kingdom of *Lelit Pattan*, and he was in the actual government of it, when I arrived at *Népál*; but the nobles perceiving that PRIT'HWI'NA'RA'YAN ſtill continued to interrupt the tranquillity of the kingdom, they diſclaimed all ſubjection to him, and acknowledged for their ſovereign DELMERDEN SA'H, who continued the war againſt his brother PRIT'HWI-

NA'RA'YAN:

NARA'YAN: but ſome years afterwards, they even depoſed DELMERDEN SA'H, and elected in his room a poor man of *Lelit Pattan*, who was of royal origin.

The king of *Bh'atgán*, in order to wage war with the other kings of *Népál*, had demanded aſſiſtance from PRIT'HWI'NA'RA'YAN: but ſeeing that PRIT'HWI'NA'RA'YAN was poſſeſſing himſelf of the country, he was obliged to deſiſt, and to take meaſures for the defence of his own poſſeſſions, ſo that the king of *Górc'hà*, although he had been formerly a ſubject of GAINPREJAS, taking advantage of the diſſentions, which prevailed among the other kings of *Népál*, attached to his party many of the mountain chiefs, promiſing to keep them in poſſeſſion, and alſo to augment their authority and importance; and, if any of them were guilty of a breach of faith, he ſeized their country as he had done to the kings of *Marecajis*, although his relations.

The king of *Górc'hà* having already poſſeſſed himſelf of all the mountains which ſurround the plain of *Népál*, began to deſcend into the flat country, imagining he ſhould be able to carry on his operations with the ſame facility and ſucceſs, as had attended him on the hills; and, having drawn up his army before a town, containing about 8000 houſes, ſituate upon a hill called *Círtipur*, about a league's diſtance from *Cat'hmándú*, employed his utmoſt endeavours to get poſſeſſion of it: the inhabitants of *Círtipur* receiving no ſupport from the king of *Lelit Pattan*, to whom they were ſubject, applied for aſſiſtance to GAINPREJAS, who immediately marched with his whole army to their relief, gave battle to the army of the king of *Górc'hà*, and obtained a complete victory. A brother of the king of *Górc'hà* was killed on the field of battle; and the king himſelf, by the aſſiſtance of good bearers, narrowly eſcaped with his life by fleeing into the mountains: after the action, the inhabitants of *Círtipur* demanded GAINPREJAS for their king, and the nobles of the town went to confer with him on the buſineſs, but, being all aſſembled in the ſame apartment with the king, they were all ſurprized and ſeized by his people. After the ſeizure of thoſe perſons, GAINPREJAS, perhaps to revenge himſelf of theſe nobles, for having refuſed their concurrence to his nomination as king, privately cauſed ſome of them to be put to death; another, by name DANUVANTA, was led through the city in a woman's dreſs, along with ſeveral others, clothed in a ridiculous and whimſical manner, at the expence of the nobles of *Lelit Pattan*. They were then kept in cloſe confinement for a long time: at laſt, after making certain promiſes, and intereſting all the principal men of the country in their behalf, GAINPREJAS ſet them at liberty.

The

The king of *Górc'hà*, deſpairing of his ability to get poſſeſſion of the plain of *Népál* by ſtrength, hoped to effect his purpoſe by cauſing a famine, and with this deſign, ſtationed troops at all the paſſes of the mountains to prevent any intercourſe with *Népál*; and his orders were moſt rigorouſly obeyed; for every perſon who was found in the road, with only a little ſalt or cotton about him, was hung upon a tree; and he cauſed all the inhabitants of a neighbouring village to be put to death in a moſt cruel manner: even the women and children did not eſcape, for having ſupplied a little cotton to the inhabitants of *Népál*; and, when I arrived in that country at the beginning of 1769, it was a moſt horrid ſpectacle to behold ſo many people hanging on trees in the road. However the king of *Górc'hà* being alſo diſappointed in his expectations of gaining his end by this project, fomented diſſentions among the nobles of the three kingdoms of *Népál*, and attached to his party many of the principal ones by holding forth to them liberal and enticing promiſes, for which purpoſe he had about 2000 *Bráhmens* in his ſervice. When he thought he had acquired a party ſufficiently ſtrong, he advanced a ſecond time with his army to *Círtipur*, and laid ſiege to it on the north weſt quarter, that he might avoid expoſing his army between the two cities of *Cat'hmándú*, and *Lelit Pattan*. After a ſiege of ſeveral months, the king of *Górc'hà* demanded the regency of the town of *Círtipur*, when the commandant of the town, ſeconded by the approbation of the inhabitants, diſpatched to him by an arrow a very impertinent and exaſperating anſwer. The king of *Górc'hà* was ſo much enraged at this mode of proceeding, that he gave immediate orders to all his troops to ſtorm the town on every ſide: but the inhabitants bravely defended it, ſo that all the efforts of his men availed him nothing; and, when he ſaw that his army had failed of gaining the precipice, and that his brother named SURUPARATNA had fallen wounded by an arrow, he was obliged to raiſe the ſiege a ſecond time and to retreat with his army from *Círtipur*. The brother of the king was afterwards cured of his wound by our father MICHAEL ANGELO, who is at preſent in *Bettia*.

After the action the king of *Górc'hà* ſent his army againſt the king of *Lamji*, (one of the twenty-four kings who reign to the weſtward of *Népál*) bordering upon his own kingdom of *Górc'hà*: after many deſperate engagements an accommodation took place, with the king of *Lamji*: and the king of *Górc'hà* collecting all his forces, ſent them for the third time to beſiege *Círtipur*, and the army on this expedition was commanded by his brother SURUPARATNA. The inhabitants of *Círtipur* defended themſelves with their uſual bravery, and after a ſiege of ſeveral months,

months, the three kings of *Népál* aſſembled at *Cat'hmándú* to march a body of troops to the relief of *Círtipur*: one day in the afternoon they attacked ſome of the *Tanas* of the *Górc'hians*, but did not ſucceed in forcing them, becauſe the king of *Górc'hà*'s party had been reinforced by many of the nobility, who to ruin GAINPREJAS were willing to ſacrifice their own lives. The inhabitants of *Cír-tipur* having already ſuſtained ſix or ſeven months ſiege, a noble of *Lelit Pattan* called DANUVANTA fled to the *Górc'hà* party, and treacherouſly introduced their army into the town: the inhabitants might ſtill have defended themſelves, having many other fortreſſes in the upper parts of the town to retreat to; but the people at *Górc'hà* having publiſhed a general amneſty, the inhabitants greatly exhauſted by the fatigues of a long ſiege, ſurrendered themſelves priſoners upon the faith of that promiſe. In the mean time the men of *Górc'hà* ſeized all the gates and for-treſſes within the town; but two days afterwards PRIT'HWINA'RA'YAN, who was at *Navacúta* (a long day's journey diſtant) iſſued an order to SURU'PARATNA, his brother, to put to death ſome of the principal inhabitants of the town, and to cut off the noſes and lips of every one, even the infants, who were not found in the arms of their mothers; ordering at the ſame time all the noſes and lips, which had been cut off, to be preſerved, that he might aſcertain how many ſouls there were, and to change the name of the town into *Naſkatápur*, which ſignifies the *town of cut-noſes*, the order was carried into execution with every mark of horror and cruelty, none eſcaping, but thoſe who could play on wind inſtruments; although father MICHAEL ANGELO, who, without knowing that ſuch an inhuman ſcene was then exhibited, had gone to the houſe of SURU'PARATNA, interceded much in favour of the poor inhabitants: many of them put an end to their lives in deſpair; others came in great bodies to us in ſearch of medicines, and it was moſt ſhocking to ſee many living people with their teeth and noſes reſembling the ſkulls of the deceaſed.

After the capture of *Círtipur*, PRIT'HWI'NA'RA'YAN diſpatched immediately his army to lay ſiege to the great city of *Lelit Pattan*. The *Górc'hians* ſurrounded half the city to the weſtward with their *Tanas*, and, my houſe being ſituated near the gate of that quarter, I was obliged to retire to *Cat'hmándú* to avoid being expoſed to the fire of the beſiegers. After many engagements between the inhabitants of the town of *Lelit Pattan*, and the men of *Górc'hà*, in which much blood was ſpilled on both ſides, the former were diſpoſed to ſurrender themſelves, from the fear of having their noſes cut off, like thoſe at *Círtipur*, and alſo their right hands, a barbarity the *Górc'hians* had threatened them with, unleſs they would ſurrender within five days. One night all the *Górc'hians* quitted the ſiege of *Lelit Pattan* to

purſue

purſue the *Engliſh* army, which, under the command of Captain KINLOCH, had already taken *Sidúli*, an important fort at the foot of the *Népál* hills, which border upon the kingdom of *Tirhùt*: but Captain KINLOCH not being able to penetrate the hills, either on the *Sidúli* quarter or by the paſs at *Hareapur*, in the kingdom of *Macwanpur*, the army of *Górc'hà* returned to *Népál* to direct their operations againſt the city of *Cat'hmándú*, where GAINPREJAS was, who had applied for ſuccour to the *Engliſh*. During the ſiege of *Cat'hmándú* the *Bráhmens* of *Górc'hà* came almoſt every night into the city, to engage the chiefs of the people on the part of their king, and the more effectually to impoſe upon poor GAINPREJAS, many of the principal *Bráhmens* went to his houſe, and told him to perſevere with confidence, that the chiefs of the *Górc'hà* army were attached to his cauſe, and that even they themſelves would deliver up their king PRIT'HWINA'RA'YAN to his hands. Having by theſe artifices procured an opportunity of detaching from his party all his principal ſubjects, tempting them with liberal promiſes according to their cuſtom, one night the men of *Górc'hà* entered the city without oppoſition, and the wretched GAINPREJAS, perceiving he was betrayed, had ſcarce time to eſcape with about three hundred of his beſt and moſt faithful *Hinduſtáni* troops towards *Lelit Pattan*, which place however he reached the ſame night.

The king of *Górc'hà* having made himſelf maſter of *Cat'hmándú* in the year 1768, perſiſted in the attempt of poſſeſſing himſelf alſo of the city of *Lelit Pattan*, promiſing all the nobles, that he would ſuffer them to remain in the poſſeſſion of their property, that he would even augment it; and, becauſe the nobles of *Lelit Pattan* placed a reliance on the faith of his promiſes, he ſent his domeſtick prieſt to make this proteſtation; that, if he failed to acquit himſelf of his promiſe, he ſhould draw curſes upon himſelf and his family even to the fifth, paſt and ſucceeding generation, ſo that the unhappy GAINPREJAS and the king of *Lelit Pattan*, ſeeing that the nobility were diſpoſed to render themſelves ſubject to the king of *Górc'hà*, withdrew themſelves with their people to the king of *B'hatgàn*: when the city of *Lelit Pattan* became ſubject to the king of *Górc'hà*, he continued for ſome time to treat the nobility with great attention, and propoſed to appoint a viceroy of the city from among them. Two or three months afterwards, having appointed the day for making his formal entrance into the city of *Lelit Pattan*, he made uſe of innumerable ſtratagems to get into his poſſeſſion the perſons of the nobility, and in the end ſucceeded; he had prevailed upon them to permit their ſons to remain at court as companions of his ſon; he had diſpatched a noble of each houſe to *Navacút*, or *New Fort*, pretending that the apprehenſions he entertained of them had prevented his

his making a public entrance into the city; and the remaining nobles were ſeized at the river without the town, where they went to meet him agreeably to a prior engagement. Afterwards he entered the city, made a viſit to the temple of BAGHERO, adjoining to our habitation, and paſſing in triumph through the city amidſt immenſe numbers of ſoldiers, who compoſed his train, entered the royal palace, which had been prepared for his reception; in the mean time parties of his ſoldiers broke open the houſes of the nobility, ſeized all their effects, and threw the inhabitants of the city into the utmoſt conſternation: after having cauſed all the nobles who were in his power to be put to death, or rather their bodies to be mangled in a horrid manner, he departed with a deſign of beſieging *B'hatgán*, and we obtained permiſſion, through the intereſt of his ſon, to retire with all the *Chriſtians* into the poſſeſſions of the *Engliſh*.

At the commencement of the year 1769, the king of *Górc'hà* acquired poſſeſſion of the city of *B'hatgán*, by the ſame expedients to which he owed his former ſucceſſes, and on his entrance with his troops into the city, GAINPREJAS, ſeeing he had no reſource left to ſave himſelf, ran courageouſly with his attendants towards the king of *Górc'hà*, and, at a ſmall diſtance from his palanquin, received a wound in his foot, which a few days afterwards occaſioned his death. The king of *Lelit Pattan* was confined in irons till his death, and the king of *B'hatgán*, being very far advanced in years, obtained leave to go and die at *Banares*. A ſhort time afterwards the mother of GAINPREJAS alſo procured the ſame indulgence, having from old age already loſt her eye-ſight; but before her departure they took from her a necklace of jewels; as ſhe herſelf told me, when ſhe arrived at *Patna* with the widow of her grand-ſon: and I could not refrain from tears, when I beheld the miſery and diſgrace of this blind and unhappy queen.

The king of *Górc'hà*, having thus in the ſpace of four years effected the conqueſt of *Népál*, made himſelf maſter alſo of the country of the *Cirátas* to the eaſt of it, and of other kingdoms, as far as the borders of *Cóch Bihàr*: after his deceaſe, his eldeſt ſon PRATA'P SINH held the government of the whole country; but ſcarcely two years after on PRATA'P SINH's death, a younger brother, by name BAHA'DAR SA'H, who reſided then at *Bettía* with his uncle DELMERDEN SA'H, was invited to accept of the government, and the beginning of his government was marked with many maſſacres. The royal family is in the greateſt confuſion, becauſe the queen lays claim to the government in the name of her ſon, whom ſhe had by PRATA'P SINH; and perhaps the oath violated by PRIT'HWINA'RA'YAN will in the progreſs of time have its effect. Such have been the ſucceſſors of the kingdoms of *Népál*, of which PRITWINA'RA'YAN had thus acquired poſſeſſion.

ON

XVIII.

ON THE CURE OF PERSONS BITTEN BY SNAKES.

By JOHN WILLIAMS, *Eſq.*

THE following ſtatement of facts relative to the cure of perſons bitten by ſnakes, ſelected from a number of caſes, which have come within my own knowledge, require no prefatory introduction; as it points out the means of obtaining the greateſt ſelf-gratification the human mind is capable of experiencing; that of the preſervation of the life of a fellow-creature, and ſnatching him from the jaws of death, by a method which every perſon is capable of availing himſelf of. Eau de Luce, I learn from many communications which I have received from different parts of the country, anſwers as well as the pure Cauſtick Alkali Spirit; and though, from its having ſome eſſential oils in its compoſition, it may not be ſo powerful, yet, as it muſt be given with water, it only requires to encreaſe the doſe in proportion; and, ſo long as it retains its milky white colour, it is ſufficiently efficacious.

From the effect of a ligature applied between the part bitten and the heart, it is evident that the poiſon diffuſes itſelf over the body by the returning venous blood; deſtroying the irritability, and rendering the ſyſtem paralytick. It is therefore probable that the Volatile Cauſtick Alkali in reſiſting the diſeaſe of the poiſon, does not act ſo much as a ſpecifick in deſtroying its quality, as by counteracting the effect on the ſyſtem, by ſtimulating the fibres, and preſerving that irritability which it tends to deſtroy.

CASE I.

In the month of *Auguſt*, 1780, a ſervant of mine was bitten in the heel, as he ſuppoſed, by a ſnake; and in a few minutes was in great agony, with convulſions about the throat and jaws, and continual grinding of teeth: having a wiſh to try the effects of Volatile Alkali in ſuch caſes, I gave him about forty drops of Eau de Luce in water, and applied ſome of it to the part bitten; the doſe was repeated every eight or ten minutes, till a ſmall phial-full was expended: it was near two hours before it could be ſaid he was out of danger. A numbneſs and pricking ſenſation was perceived extending itſelf up to the knee, where a ligature was applied ſo tight as to ſtop the returning venous blood, which ſeemingly checked the progreſs of the deleterious poiſon. The foot and leg, up to where the ligature was made, were

ſtiff and painful for ſeveral days; and, which appeared very ſingular, were covered with a branny ſcale.

The above was the firſt caſe in which I tried the effects of the Volatile Alkali, and, apprehending that the eſſential oils in the compoſition of Eau de Luce, though made of the ſtrong Cauſtick Volatile Spirit, would conſiderably diminiſh its powers. I was induced, the next opportunity that offered, to try the effects of pure Volatile Cauſtick Alkali Spirit, and accordingly prepared ſome from Quicklime and the Sal Ammoniack of this country.

CASE II.

In *July*, 1782, a woman of the *Bráhmen* caſt, who lived in my neighbourhood at *Chundr*, was bitten by a *Cobra de Capello* between the thumb and fore-finger of her right hand: prayers and ſuperſtitious incantations were practiſed by the *Bráhmens* about her till ſhe became ſpeechleſs and convulſed, with locked jaws, and a profuſe diſcharge of ſaliva running from her mouth. On being informed of the accident, I immediately ſent a ſervant with a bottle of the Volatile Cauſtick Alkali Spirit, of which he poured about a tea-ſpoon-full, mixed with water, down her throat, and applied ſome of it to the part bitten: the doſe was repeated a few minutes after, when ſhe was evidently better, and in about half an hour was perfectly recovered.

This accident happened in a ſmall hut, where I ſaw the ſnake, which was a middle-ſized *Cobra de Capello:* the *Bráhmens* would not allow it to be killed. In the above caſe, no other means whatever were uſed for the recovery of the patient than are here recited.

CASE III.

A woman-ſervant in the family of a gentleman at *Benares* was bitten in the foot by a *Cobra de Capello:* the gentleman immediately applied to me for ſome of the Volatile Cauſtick Alkali, which I fortunately had by me. I gave her about ſixty drops in water, and alſo applied ſome of it to the part bitten: in about ſeven or eight minutes after, ſhe was quite recovered. In the above caſe, I was not witneſs to the deleterious effect of the poiſon on the patient; but ſaw the ſnake after it was killed.

CASE IV.

In *July*, 1784, the wife of a ſervant of mine was bitten by a *Cobra de Capello* on the out-ſide of the little toe of her right foot. In a few minutes ſhe became convulſed,

vulſed, particularly about the jaws and throat, with a continued gnaſhing of the teeth. She at firſt complained of a numbneſs extending from the wound upwards, but no ligature was applied to the limb. About ſixty drops of the Volatile Cauſtick Spirit were given to her in water, by forcing open her mouth, which was ſtrongly convulſed: in about ſeven minutes the doſe was repeated, when the convulſions left her; and in three more ſhe became ſenſible, and ſpoke to thoſe who attended her. A few drops of the ſpirit had alſo been applied to the wound. The ſnake was killed and brought to me, which proved to be a *Cobra de Capello*.

CASE V.

As it is generally believed, that the venom of ſnakes is more malignant during hot dry weather, than at any other ſeaſon, the following caſe, which occurred in the month of *July*, 1788, when the weather was extremely hot, no rain, excepting a ſlight ſhower, having fallen for many months, may not be unworthy notice.

A ſervant belonging to an Officer at *Juanpoor*, was bitten by a ſnake on the leg, about two inches above the outer ankle. As the accident happened in the evening, he could not ſee what ſpecies of ſnake it was: he immediately tied a ligature above the part bitten, but was in a few minutes in ſuch exquiſite torture from pain, which extended up his body and to his head, that he ſoon became dizzy and ſenſeleſs. On being informed of the accident, I ſent my ſervant with a phial of the Volatile Cauſtick Alkali, who found him, when he arrived, quite torpid, with the ſaliva running out of his mouth, and his jaws ſo faſt locked, as to render it neceſſary to uſe an inſtrument, to open them and adminiſter the medicine. About forty drops of the Volatile Cauſtick Spirit were given to him in water, and applied to the wound; and the ſame doſe repeated a few minutes after. In about half an hour he was perfectly recovered. On examining the part bitten, I could diſcover the marks of three fangs; two on one ſide, and one on the other; and, from the diſtance they were aſunder, I ſhould judge it a large ſnake. More than ten minutes did not appear to have elapſed from the time of his being bitten, till the medicine was adminiſtered. The wounds healed immediately, and he was able to attend to his duty the next day. Though the ſpecies of ſnake was not aſcertained, yet I judge from the flow of ſaliva from the mouth, convulſive ſpaſms of the jaws and throat, as well as from the marks of three fangs, that it muſt have been a *Cobra de Capello*; and, though I have met with five and ſix fangs of different ſizes in ſnakes of that ſpecies,

I never

I never obſerved the marks of more than two having been applied in biting in any other caſe, which came within my knowledge.

CASE VI.

In *September*, 1786, a ſervant belonging to Captain S——, who was then at *Benares*, was bitten in the leg by a large *Cobra de Capello*: he ſaw the ſnake coming towards him, with his neck ſpread out in a very tremendous manner, and endeavoured to avoid him; but, before he could get out of his way, the ſnake ſeized him by the leg, and ſecured his hold for ſome time, as if he had not been able to extricate his teeth. Application was immediately made to his maſter for a remedy, who ſent to conſult me; but, before I arrived, had given him a quantity of ſweet oil, which he drank. So ſoon as I ſaw him, I directed the uſual doſe of Volatile Cauſtick Alkali to be given, which fortunately brought away the oil from his ſtomach, or it is probable that the ſtimulating effect of the Volatile Spirit would have been ſo much blunted by it, as to have become inefficacious: a ſecond doſe was immediately adminiſtered, and ſome time after a third. The man recovered in the courſe of a few hours. As oil is frequently adminiſtered as a remedy in the bite of ſnakes, I think it neceſſary to caution againſt the uſe of it with the Volatile Alkali, as it blunts the ſtimulating quality of the ſpirit, and renders it uſeleſs.

Of the numerous ſpecies of ſnakes which I have met with, not above ſix were provided with poiſonous fangs; though I have examined many which have been conſidered by the natives as dangerous, without being able to diſcover any thing noxious in them.

The following is an inſtance of the deleterious effect of the bite of a ſnake called by the natives *Krait*, a ſpecies of the *Boa*, which I have frequently met with in this part of the country.

CASE VII.

On the 16th *September*, 1788, a man was brought to me who had been bitten by a ſnake, with the marks of two fangs on two of his toes; he was ſaid to have been bitten above an hour before I ſaw him: he was perfectly ſenſible, but complained of great pain in the parts bitten, with an univerſal languor. I immediately gave him thirty drops of the Volatile Cauſtick Alkali Spirit in water, and applied ſome of it to the wounds: in a few minutes he became eaſier, and in about half an hour was carried away by his friends, with perfect confidence in his recovery, without having taken

taken a ſecond doſe of the medicine, which indeed did not appear to have been neceſſary; but, whether from the effect of the bite of the ſnake, or the motion of the dooly on which he was carried, I know not; but he became ſick at the ſtomach, threw up the medicine, and died in about a quarter of an hour after. The man ſaid, that the ſnake came up to him while he was ſitting on the ground; and that he put him away with his hand once, but that he turned about and bit him as deſcribed: the ſnake was brought to me which I examined; it was about two feet and a half long, of a lightiſh brown colour on the back, a white belly, and annulated from end to end, which 208 abdominal, and forty-ſix tail ſcuta. I have met with ſeveral of them from thirteen inches to near three feet in length: it had two poiſonous fangs in the upper jaw, which lay naked, with their points without the upper lip. It does not ſpread its neck like the *Cobra de Capello*, when enraged; but is very active and quick in its motion.

I have ſeen inſtances of perſons bitten by ſnakes, who have been ſo long without aſſiſtance, that, when they have been brought to me, they have not been able to ſwallow, from convulſions of the throat and fauces, which is, I obſerve, a conſtant ſymptom of the bite of the *Cobra de Capello*: and indeed I have had many perſons brought to me who had been dead ſome time; but never knew an inſtance of the Volatile Cauſtick Alkali failing in its effect, where the patient has been able to ſwallow it.

XIX.

ON SOME ROMAN COINS FOUND AT NELORE.

To the PRESIDENT *of the* ASIATICK SOCIETY.

SIR,

I HAVE the honour to preſent you with an extract of a letter from Mr. ALEXANDER DAVIDSON, late Governor of *Madras*, giving an account of ſome *Roman Coins* and *Medals* lately found near *Nelòr*, together with a drawing of them copied from one tranſmitted by Mr. DAVIDSON; which, I imagine, may be acceptable to the *Aſiatick* Society.

I have the honour to be,

Sir,

Your moſt obedient humble ſervant,

S. DAVIS.

Calcutta, March 20, 1788.

EXTRACT OF A LETTER FROM ALEXANDER DAVIDSON, ESQ.

DATED MADRAS, JULY 12, 1787.

A PEASANT near *Nelòr*, about 100 miles north-weſt of *Madras*, was ploughing on the ſide of a ſtony craggy hill: his plough was obſtructed by ſome brickwork: he dug, and diſcovered the remains of a ſmall *Hindu* temple, under which a little pot was found with *Roman* Coins and Medals of the ſecond century.

He ſold them as old gold; and many no doubt were melted, but the *Nawáb* AMI'RUL UMARA' recovered upwards of thirty of them. This happened while I was governor; and I had the choice of two out of the whole. I choſe an ADRIAN and a FAUSTINA.

Some of the TRAJANS were in good preſervation. Many of the Coins could not have been in circulation: they were all of the pureſt gold, and many of them as freſh and beautiful as if they had come from the Mint but yeſterday: ſome were much defaced and perforated, and had probably been worn as ornaments on the arm and others pending from the neck.

I ſend you drawings of my two Coins, and have no Objection to your publiſhing an account of them in the Tranſactions of the *Aſiatick* Society. I received my information reſpecting them from the young *Nawáb*, and if my name be neceſſary to authenticate the facts I have related, you have my permiſſion to uſe it.

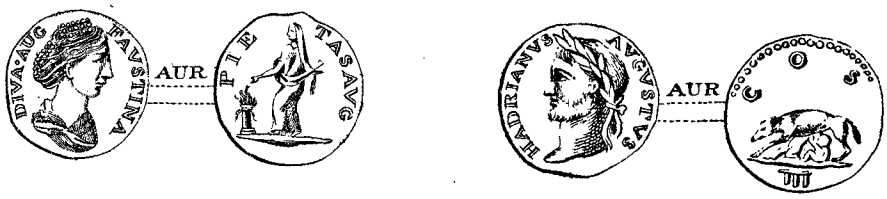
XX.

ON TWO HINDU FESTIVALS, AND THE INDIAN SPHINX.

By the late COLONEL PEARSE, *May* 12, 1785.

I BEG leave to point out to the Society, that the *Sunday* before laſt was the Feſtival of BHAVA'NI', which is annually celebrated by the *Gópas* and all other *Hindus*, who keep horned cattle for uſe or profit; on this feaſt they viſit gardens, erect a pole in the fields, and adorn it with pendants and garlands. The *Sunday* before laſt was our *firſt* of *May*, on which the ſame rites are performed by the ſame claſs of people in *England*, where it is well known to be a relique of ancient ſuperſtition in that country: it ſhould ſeem, therefore, that the religion of the Eaſt and the old religion

of


DIVA·AVG FAVSTINA
AUR
PIETAS AVG
HADRIANVS AVGVSTVS
AUR
COS
III

of *Britain* had a ſtrong affinity. BHAVA'NI' has another feſtival; but that is not kept by any one ſet of *Hindus* in particular, and this is appropriated to one claſs of people; this is conſtantly held on the *ninth* of *Baiſác'h*; which does not always fall on our *firſt* of *May*, as it did this year. Thoſe members of the Society, who are acquainted with the rules which regulate the feſtivals, may be able to give better information concerning this point: I only mean to point out the reſemblance of the rites performed here and in *England*, but muſt leave abler hands to inveſtigate the matter further, if it ſhould be thought deſerving of the trouble. I find, that the feſtival, which I have mentioned, is one of the moſt ancient among the *Hindus*.

II. During the *Húlì*, when mirth and feſtivity reign among *Hindus* of every claſs, one ſubject of diverſion is to ſend people on errands and expeditions, that are to end in diſappointment, and raiſe a laugh at the expence of the perſon ſent. The *Húlì* is always in *March*, and the laſt day is the greateſt holiday: all the *Hindus*, who are on that day at *Jagannát'h*, are entitled to certain diſtinctions, which they hold to be of ſuch importance, that I found it expedient to ſtay there till the end of the feſtival; and I am of opinion, and ſo are the reſt of the officers, that I ſaved above five hundred men by the delay. The origin of the *Húlì* ſeems loſt in antiquity; and I have not been able to pick up the ſmalleſt account of it.

If the rites of MAYDAY ſhew any affinity between the religion of *England* in times paſt and that of the *Hindus* in theſe times, may not the cuſtom of making *April-fools*, on the firſt of that month, indicate ſome traces of the *Húlì?* I have never yet heard any account of the origin of the *Engliſh* cuſtom; but it is unqueſtionably very ancient, and is ſtill kept up even in great towns, though leſs in them than in the country: with us it is chiefly confined to the lower claſſes of people; but in *India* high and low join in it; and the late SHUJA'UL DAULAH, I am told, was very fond of making *Húlì*-fools, though he was a *Muſelman* of the higheſt rank. They carry it here ſo far, as to ſend letters making appointments, in the names of perſons, who, it is known, muſt be abſent from their houſe at the time fixed on; and the laugh is always in proportion to the trouble given.

III. At *Jagannát'h* I found the *Sphinx* of the *Egyptians*, and preſent the Society with a drawing of it. MURARI *Pandit*, who was deputy *Faujdàr* of *Balaſór*, attended my detachment on the part of the *Mahrátas:* he is now the principal *Faujdàr*, and is much of the gentleman, a man of learning, and very intelligent. From him I learned, that the *Sphinx*, here called *Singh*, is to appear at the end of the

the world, and, as ſoon as he is born, will prey on an elephant: he is, therefore, figured ſeizing an elephant in his claws, and the elephant is made ſmall, to ſhow that the *Singh*, even a moment after his birth, will be very large in proportion to it.

When I told MURA'RI, that the *Egyptians* worſhipped a bull and choſe the God by a black mark on his tongue, and that they adored birds and trees, he immediately exclaimed "their religion then was the ſame with ours; for we alſo choſe our "*ſacred bulls* by the *ſame marks*; we reverence the *hanſa*, the *garura*, and other "birds; we reſpect the *pippal* and the *vata* among trees, and the *tulasì* among "ſhrubs; but as for onions (which I had mentioned), they are eaten by low men, "and are fitter to be eaten than worſhipped."

REMARK BY THE PRESIDENT.

Without preſuming to queſtion the authority of MURA'RI *Pandit*, I can only ſay that ſeveral *Bráhmans*, now in *Bengal*, have ſeen the figure at *Jagannát'h*, where one of the gates is called *Sinhadwár*; and they aſſure me, that they always conſidered it as a mere repreſentation of a *Lion* ſeizing a young elephant; nor do they know, they ſay, any ſenſe for the word *Sinha*, but a *Lion*, ſuch as Mr. HASTINGS kept near his garden. The *Húlì*, called *Hólácà* in the *Védas*, and *P'halgútſava* in common *Sanſcrit* books, is the feſtival of the vernal ſeaſon, or *Naurúz* of the *Perſians*.

XXI.

A SHORT DESCRIPTION OF CARNICOBAR, BY MR. G. HAMILTON.

Communicated by Mr. ZOFFANY.

THE iſland, of which I propoſe to give a ſuccinct account, is the northernmoſt of that cluſter in the *Bay* of *Bengal*, which goes by the name of the *Nicobars*. It is low, of a round figure, about forty miles in circumference, and appears at a diſtance as if entirely covered with trees: however, there are ſeveral well cleared and delightful ſpots upon it. The ſoil is a black kind of clay, and marſhy. It produces in great abundance, and with little care, moſt of the tropical fruits, ſuch as pine-apples, plantains, papayas, cocoa-nuts, and areca-nuts; alſo excellent yams,

and

and a root called *cachu*. The only four-footed animals upon the iſland are hogs, dogs, large rats, and an animal of the lizard kind, but large, called by the natives *tolonqui*; theſe frequently carry off fowls and chickens. The only kind of poultry are hens, and thoſe not in great plenty. There are abundance of ſnakes of many different kinds, and the inhabitants frequently die of their bites. The timber upon the iſland is of many ſorts, in great plenty, and ſome of it remarkably large, affording excellent materials for building or repairing ſhips.

The natives are low in ſtature, but very well made, and ſurprizingly active and ſtrong; they are copper-coloured, and their features have a caſt of the *Malay*; quite the reverſe of elegant. The women in particular are extremely ugly. The men cut their hair ſhort, and the women have their heads ſhaved quite bare, and wear no covering but a ſhort petticoat, made of a ſort of ruſh or dry graſs, which reaches half way down the thigh. This graſs is not interwoven, but hangs round the perſon ſomething like the thatching of a houſe. Such of them as have received preſents of cloth-petticoats from the ſhips, commonly tie them round immediately under the arms. The men wear nothing but a narrow ſtrip of cloth about the middle, in which they wrap up their privities ſo tight that there hardly is any appearance of them. The ears of both ſexes are pierced when young, and by ſqueezing into the holes large plugs of wood, or hanging heavy weights of ſhells, they contrive to render them wide, and diſagreeable to look at. They are naturally diſpoſed to be good-humoured and gay, and are very fond of ſitting at table with *Europeans*, where they eat every thing that is ſet before them; and they eat moſt enormouſly. They do not care much for wine, but will drink bumpers of arrack as long as they can ſee. A great part of their time is ſpent in feaſting and dancing. When a feaſt is held at any village, every one that chooſes goes uninvited, for they are utter ſtrangers to ceremony. At thoſe feaſts they eat immenſe quantities of pork, which is their favourite food. Their hogs are remarkably fat, being fed upon the cocoa-nut kernel and ſea-water: indeed all their domeſtic animals, fowls, dogs, &c. are fed upon the ſame. They have likewiſe plenty of ſmall ſea-fiſh, which they ſtrike very dextrouſly with lances, wading into the ſea about knee deep. They are ſure of killing a very ſmall fiſh at ten or twelve yards diſtance. They eat the pork almoſt raw, giving it only a haſty grill over a quick fire. They roaſt a fowl, by running a piece of wood through it, by way of ſpit, and holding it over a briſk fire, until the feathers are burnt off, when it is ready for eating, in their taſte. They never drink water; only cocoa-nut milk and a liquor called *foura*,

which oozes from the cocoa-nut tree after cutting off the young ſprouts or flowers. This they ſuffer to ferment before it is uſed, and then it is intoxicating, to which quality they add much by their method of drinking it, by ſucking it ſlowly through a ſmall ſtraw. After eating, the young men and women, who are fancifully dreſt with leaves, go to dancing, and the old people ſurround them ſmoaking *tobacco* and drinking *ſoura*. The dancers, while performing, ſing ſome of their tunes, which are far from wanting harmony, and to which they keep exact time. Of muſical inſtruments they have only one kind, and that the ſimpleſt. It is a hollow bamboo about 2½ feet long and three inches in diameter, along the outſide of which there is ſtretched from end to end a ſingle ſtring made of the threads of a ſplit cane, and the place under the ſtring is hollowed a little to prevent it from touching. This inſtrument is played upon in the ſame manner as a guitar. It is capable of producing but few notes; the performer however makes it ſpeak harmonioufly, and generally accompanies it with the voice.

What they know of phyſick is ſmall and ſimple. I had once occaſion to ſee an operation in ſurgery performed on the toe of a young girl, who had been ſtung by a ſcorpion or centipee. The wound was attended with a conſiderable ſwelling, and the little patient ſeemed in great pain. One of the natives produced the under jaw of a ſmall fiſh, which was long, and planted with two rows of teeth as ſharp as needles: taking this in one hand, and a ſmall ſtick by way of hammer in the other, he ſtruck the teeth three or four times into the ſwelling, and made it bleed freely: the toe was then bound up with certain leaves, and next day the child was running about perfectly well.

Their houſes are generally built upon the beach in villages of fifteen or twenty houſes each; and each houſe contains a family of twenty perſons and upwards. Theſe habitations are raiſed upon wooden pillars about ten feet from the ground; they are round, and, having no windows, look like bee-hives, covered with thatch. The entry is through a trap-door below, where the family mount by a ladder, which is drawn up at night. This manner of building is intended to ſecure the houſes from being infeſted with ſnakes, and rats, and for that purpoſe the pillars are bound round with a ſmooth kind of leaf, which prevents animals from being able to mount; beſides which, each pillar has a broad round flat piece of wood near the top of it, the projecting of which effectually prevents the further progreſs of ſuch vermin as may have paſſed the leaf. The flooring is made with thin ſtrips of bamboos laid at ſuch diſtances from one another, as to leave free admiſſion for light

light and air, and the inſide is neatly finiſhed and decorated with fiſhing lances, nets, &c.

The art of making cloth of any kind is quite unknown to the inhabitants of this iſland; what they have is got from the ſhips that come to trade in cocoa-nuts. In exchange for their nuts (which are reckoned the fineſt in this part of *India*) they will accept of but few articles; what they chiefly wiſh for is cloth of different colours, hatchets and hanger blades, which they uſe in cutting down the nuts. Tobacco and arak they are very fond of, but expect theſe in preſents. They have no money of their own, nor will they allow any value to the coin of other countries, further than as they happen to fancy them for ornaments; the young women ſometimes hanging ſtrings of dollars about their necks. However they are good judges of gold and ſilver, and it is no eaſy matter to impoſe baſer metals upon them, as ſuch.

They purchaſe a much larger quantity of cloth, than is conſumed upon their own iſland. This is intended for the *Choury* market. *Choury* is a ſmall iſland to the ſouthward of theirs, to which a large fleet of their boats ſails every year about the month of *November*, to exchange cloth for *Canoes*; for they cannot make theſe themſelves. This voyage they perform by the help of the ſun and ſtars, for they know nothing of the compaſs.

In their diſpoſition there are two remarkable qualities. One is their entire neglect of compliment and ceremony, and the other, their averſion to diſhoneſty. A *Carnicobarian* travelling to a diſtant village upon buſineſs or amuſement, paſſes through many towns in his way without perhaps ſpeaking to any one: if he is hungry or tired he goes up into the neareſt houſe, and helps himſelf to what he wants, and ſits till he is reſted, without taking the ſmalleſt notice of any of the family, unleſs he has buſineſs or news to communicate. Theft or robbery is ſo very rare amongſt them, that a man going out of his houſe, never takes away his ladder, or ſhuts his door, but leaves it open for any body to enter that pleaſes, without the leaſt apprehenſion of having any thing ſtolen from him.

Their intercourſe with ſtrangers is ſo frequent, that they have acquired in general the barbarous *Portugueſe* ſo common over *India*; their own language has a ſound quite different from moſt others, their words being pronounced with a kind of ſtop, or catch in the throat, at every ſyllable. The few following words will ſerve to ſhew thoſe who are acquainted with other *Indian* languages, whether there is any ſimilitude between them.

A man

A man,	*Kegonia.*	To eat,	*Gnia.*
A woman,	*Kecanna.*	To drink,	*Okk.*
A child,	*Chu.*	Yams,	*T'owla.*
To laugh,	*Ayelaur.*	To weep,	*Poing.*
A canoe,	*App.*	A pine apple,	*Frung.*
A houſe,	*Albanum.*	To ſleep,	*Loom loom.*
A fowl,	*Hayám.*	A dog,	*T'amam.*
A hog,	*Hown.*	Fire,	*T'amia.*
Fiſh,	*Ka.*	Rain,	*Koomra.*

They have no notion of a God, but they believe firmly in the devil and worſhip him from fear. In every village there is a high pole erected with long ſtrings of ground-rattans hanging from it, which, it is ſaid, has the virtue to keep him at a diſtance. When they ſee any ſigns of an approaching ſtorm, they imagine that the devil intends them a viſit, upon which many ſuperſtitious ceremonies are performed. The people of every village march round their own boundaries, and fix up at different diſtances ſmall ſticks ſplit at the top, into which ſplit they put a piece of cocoa-nut, a wiſp of tobacco, and the leaf of a certain plant: whether this is meant as a peace-offering to the devil, or a ſcarecrow to frighten him away, does not appear.

When a man dies, all his live ſtock, cloth, hatchets, fiſhing lances, and in ſhort every moveable thing he poſſeſſed is buried with him, and his death is mourned by the whole village. In one view this is an excellent cuſtom, ſeeing it prevents all diſputes about the property of the deceaſed amongſt his relations. His wife muſt conform to cuſtom by having a joint cut off from one of her fingers; and, if ſhe refuſes this, ſhe muſt ſubmit to have a deep notch cut in one of the pillars of her houſe.

I was once preſent at the funeral of an old woman. When we went into the houſe, which had belonged to the deceaſed, we found it full of her female relations; ſome of them were employed in wrapping up the corpſe in leaves and cloth, and others tearing to pieces all the cloth which had belonged to her. In another houſe hard by, the men of the village, with a great many others from the neighbouring towns, were ſitting drinking *foura* and ſmoaking tobacco. In the mean time two ſtout young fellows were buſy digging a grave in the ſand near the houſe. When the women had done with the corpſe, they ſet up a moſt hideous howl, upon which the people began to aſſemble round the grave, and four men went up into the houſe to bring down the body; in doing this they were much interrupted by a

young

young man, ſon to the deceaſed, who endeavoured with all his might to prevent them, but finding it in vain, he clung round the body, and was carried to the grave along with it: there, after a violent ſtruggle, he was turned away and conducted back to the houſe. The corpſe being now put into the grave, and the laſhings, which bound the legs and arms, cut, all the live ſtock, which had been the property of the deceaſed, conſiſting of about half a dozen hogs, and as many fowls, was killed, and flung in above it; a man then approached with a bunch of leaves ſtuck upon the end of a pole, which he ſwept two or three times gently along the corpſe, and then the grave was filled up. During the ceremony, the women continued to make the moſt horrible vocal concert imaginable: the men ſaid nothing. A few days afterwards, a kind of monument was erected over the grave, with a pole upon it, to which long ſtrips of cloth of different colours were hung.

Polygamy is not known among them; and their puniſhment of adultery is not leſs ſevere than effectual. They cut, from the man's offending member, a piece of the foreſkin proportioned to the frequent commiſſion or enormity of the crime.

There ſeems to ſubſiſt among them a perfect equality. A few perſons, from their age, have a little more reſpect paid to them; but there is no appearance of authority one over another. Their ſociety ſeems bound rather by mutual obligations continually conferred and received; the ſimpleſt and beſt of all ties.

The inhabitants of the *Andamans* are ſaid to be *Cannibals*. The people of *Carnicobar* have a tradition among them, that ſeveral canoes came from *Andaman* many years ago, and that the crews were all armed, and committed great depredations, and killed ſeveral of the *Nicobarians*. It appears at firſt remarkable, that there ſhould be ſuch a wide difference between the manners of the inhabitants of iſlands ſo near to one another; the *Andamans* being ſavage *Cannibals*, and the others, the moſt harmleſs inoffenſive people poſſible. But it is accounted for by the following hiſtorical anecdote, which, I have been aſſured, is matter of fact. Shortly after the *Portugueſe* had diſcovered the paſſage to *India* round the *Cape of Good Hope*, one of their ſhips, on board of which were a number of *Mozambique* negroes, was loſt on the *Andaman* iſlands, which were till then uninhabited. The blacks remained in the iſland and ſettled it: the *Europeans* made a ſmall ſhallop in which they ſailed to *Pegu*. On the other hand, the *Nicobar* iſlands were peopled from the oppoſite main, and the coaſt of *Pegu*; in proof of which the *Nicobar* and *Pegu* languages are ſaid, by thoſe acquainted with the latter, to have much reſemblance.

XXII.

THE DESIGN OF A TREATISE ON THE PLANTS OF INDIA. — *See the Works of Sir William Jones, Vol. II. p.* 1.

XXIII.

ON THE DISSECTION OF THE PANGOLIN.

In a Letter to GENERAL CARNAC *from* ADAM BURT, *Esq.*

Communicated by the GENERAL.

SIR,

IN compliance with your desire, I most willingly do myself the honour to present to you my observations and reflections on the dissection of one of those animals, of which we have a print, with a very short account, in the FIRST VOL. of the TRANSACTIONS of the ASIATIC SOCIETY. The animal, from which that likeness has been taken, was sent by Mr. LESLIE, from *Chitra*, to the president Sir WILLIAM JONES. It is distinguished in the TRANSACTIONS by a name, which I do not at present remember; but probably the animal is of the same genus with the *Manis*, as described in the former edition of the ENCYCLOPÆDIA BRITANNICA, or, perhaps, not different from the *Pangolin* of BUFFON.

The representation of this animal in the MEMOIRS of the ASIATIC SOCIETY, makes it unnecessary for me to enter into any general description of its external figure and appearance. There are on each foot five claws, of which the outer and inner are small when compared with the other three. There are no distinct toes; but each nail is moveable by a joint at its root. This creature is extremely inoffensive. It has *no teeth*; and its feet are unable to grasp. Hence it would appear, that nature, having furnished it with a coat of mail for its protection, has, with some regard to justice, denied it the powers of acting with hostility against its fellow-creatures. The nails are well adapted for digging in the ground; and the animal

animal is ſo dextrous in eluding its enemies by concealing itſelf in holes and among rocks that it is extremely difficult to procure one.

The upper jaw is covered with a croſs cartilaginous ridge, which though apparently not at all ſuited to any purpoſes of maſtication, may, by encreaſing the ſurface of the palate, extend the ſenſe of taſte. The œſophagus admitted my forefinger with eaſe. The tongue at the bottom of the mouth is nearly about the ſize of the little finger, from whence it tapers to a point. The animal at pleaſure protrudes this member a great way from the mouth. The tongue ariſes from the enſiform cartilage, and the contiguous muſcles of the belly, and paſſes in form of a round diſtinct muſcle from over the ſtomach, through the thorax, immediately under the ſternum; and interiour to the windpipe in the throat. When diſſected out, the tongue could be eaſily elongated ſo as to reach more than the length of the animal, excluſive of its tail. There is a cluſter of ſalivary glands ſeated around the tongue, as it enters the mouth. Theſe will neceſſarily be compreſſed by the action of the tongue; ſo as occaſionally to ſupply a plentiful flow of their ſecretion.

The ſtomach is *cartilaginus*, and analogous to that of the gallinaceous tribe of birds. It was filled with ſmall ſtones and gravel, which in this part of the country are almoſt univerſally calcareous. The inner ſurface of the ſtomach was rough to the feel, and formed into folds, the interſtices of which were filled with a frothy ſecretion. The guts were filled with a ſandy pulp, in which, however, were interſperſed a few diſtinct ſmall ſtones. No veſtiges of any animal or vegetable food could be traced in the whole primæ viæ. The gall-bladder was diſtended with a fluid reſembling in colour and conſiſtence the dregs of beer.

The ſubject was a female: its dugs were two, ſeated on the breaſt. The uterus and organs of generation were evidently thoſe of a viviparous animal.

Forcibly ſtruck with the phenomena, which this quadruped exhibited, my imagination at once overleaped the boundaries, by which ſcience endeavours to circumſcribe the productions and the ways of nature; and, believing with BUFFON, *que tout ce qui peut être eſt*, I did not heſitate to conjecture, that this animal might poſſibly derive its nouriſhment from mineral ſubſtances. This idea I accordingly hazarded in an addreſs to Colonel KYD: the ſpirit of inquiry natural to that gentleman could be ill ſatisfied by ideas thrown out apparently at random; and he ſoon called on me to explain my opinion and its foundation.

Though we have perhaps no clear idea of the manner in which vegetables extract their

their nouriſhment from earth, yet the fact being ſo, it may not be unreaſonable to ſuppoſe, that ſome animal may derive nutriment by a proceſs ſomewhat ſimilar. It appears to me, that facts produced by SPALLANZANI directly invalidate the experiments, from which he has drawn the inference, that fowls ſwallow ſtones merely from ſtupidity; and that ſuch ſubſtances are altogether unneceſſary to thoſe animals. He reared fowls, without permitting them ever to ſwallow ſand or ſtones; but he alſo eſtabliſhed the fact, that carnivorous animals may become frugivorous, and herbivorous animals may come to live on fleſh. A wood-pigeon he brought to thrive on putrid meat. The experiment on fowls, then, only corroborates the proof, that we have it in our power by habits to alter the natural conſtitution of animals. Again that eminent inveſtigator of truth found, that fowls died when fed on ſtones alone; but ſurely that fact is far ſhort of proving, that ſuch ſubſtances are not agreeable to the original purpoſes of nature in the digeſtive proceſs of theſe animals. When other ſubſtances ſhall have been detected in the ſtomach of this animal, my inference, from what I have ſeen, muſt neceſſarily fall to the ground. But if, like other animals with muſcular and cartilaginous ſtomachs, this ſingular quadruped conſume grain, it muſt be ſurprizing that no veſtige of ſuch food was found preſent in the whole alimentary canal, ſince in that thinly-inhabited country, the wild animals are free to feed without intruſion from man. Nor can it be inferred from the ſtructure of the ſtomach, that this animal lives on ants or on inſects. Animals devoured as food, though of conſiderable ſize and ſolidity, with a proportionally ſmall extent of ſurface to be acted on by the gaſtric juice and the action the ſtomach, are readily diſſolved and digeſted by animals poſſeſſing not a cartilaginous, but a membranaceous, ſtomach, as for inſtance a frog in that of a ſnake.

In the ſtomach many minerals are ſoluble, and the moſt active things which we can ſwallow. Calcareous ſubſtances are readily acted on. Dr. PRIESTLEY has aſked, "May not phlogiſtic matter be the moſt eſſential part of the food and ſup-"port of both vegetable and animal bodies?" I confeſs, that Dr. PRIESTLEY's finding cauſe to propoſe the queſtion, inclines me to ſuppoſe, that the affirmative to it may be true. Earth ſeems to be the baſis of all animal matter. The growth of the bones muſt be attended with a conſtant ſupply, and in the human ſpecies there is a copious diſcharge of calcareous matter thrown out by the kidneys and ſalivary glands. May not the quadruped in queſtion derive phlogiſton from earth; ſalt, from mineral ſubſtances? And, as it is not deprived of the power of drinking water, what elſe is neceſſary to the ſubſiſtence of his corporeal machine?

Conſidering

Conſidering the ſcaly covering of this animal, we may conceive, that it may be at leaſt neceſſary for its exiſtence, on that account, to imbibe a greater proportion of earth than is neceſſary to other animals. It may deſerve conſideration, that birds are covered with feathers, which in their conſtituent principles approach to the nature of horn and bone. Of theſe animals the gallinaceous tribe ſwallow ſtones; and the carnivorous take in the feathers and bones of their prey: the latter article is known to be ſoluble in the membranaceous ſtomachs; and hence is a copious ſupply of the earthy principles. In truth I do not know, that any thing is ſoluble in the ſtomach of animals, which may not be thence abſorbed into their circulating ſyſtem, and nothing can be ſo abſorbed without affecting the whole conſtitution.

What I have here ſtated is all that I could advance to the Colonel, but my opinion has been ſince not a little confirmed by obſerving the report of experiments by M. BRUQUATELLI of *Pavia*, on the authority of M. CRELL, by which we learn, that ſome birds have ſo great a diſſolvent power in the gaſtric juice as to diſſolve in their ſtomachs flints, rock cryſtal, calcareous ſtones, and ſhells.

I beg only farther to obſerve, that ſome things in BUFFON's deſcription of the Pangolin, not apparently quite applicable to this animal, might have been owing to his deſcription being only from the view of a dried preparation, in which the organs of generation would be obliterated and the dugs ſhrivelled away ſo as to be imperceptible: elſe that elegant philoſopher could not have aſſerted that, "*tous les animaux quadrupedes, qui ſont couverts d'écailles, ſont ovipares.*"

Excuſe my prolixity, which is only in me the neceſſary attendant of my ſuperficial knowledge of things. In ingenuouſneſs, however, I hope that I am not inferior to any man; and I am proud to ſubſcribe myſelf,

Sir,

Your moſt obedient and humble ſervant,

ADAM BURT.

GYA, *September* 14, 1780.

A LETTER FROM DOCTOR ANDERSON TO SIR WILLIAM JONES.

DEAR SIR,

THE male *Lac* insect having hitherto escaped the observation of naturalists, I send the enclosed description made by Mr. WILLIAM ROXBURGH, Surgeon on this establishment, and Botanist to the Honourable Company, in hopes you will give it a place in the publication of your Society, as Mr. ROXBURGH's discovery will bring Lac a Genus into the Class Hemiptera of LINNÆUS.

I am, with esteem,
Dear Sir,
Your very obedient servant,
JAMES ANDERSON.

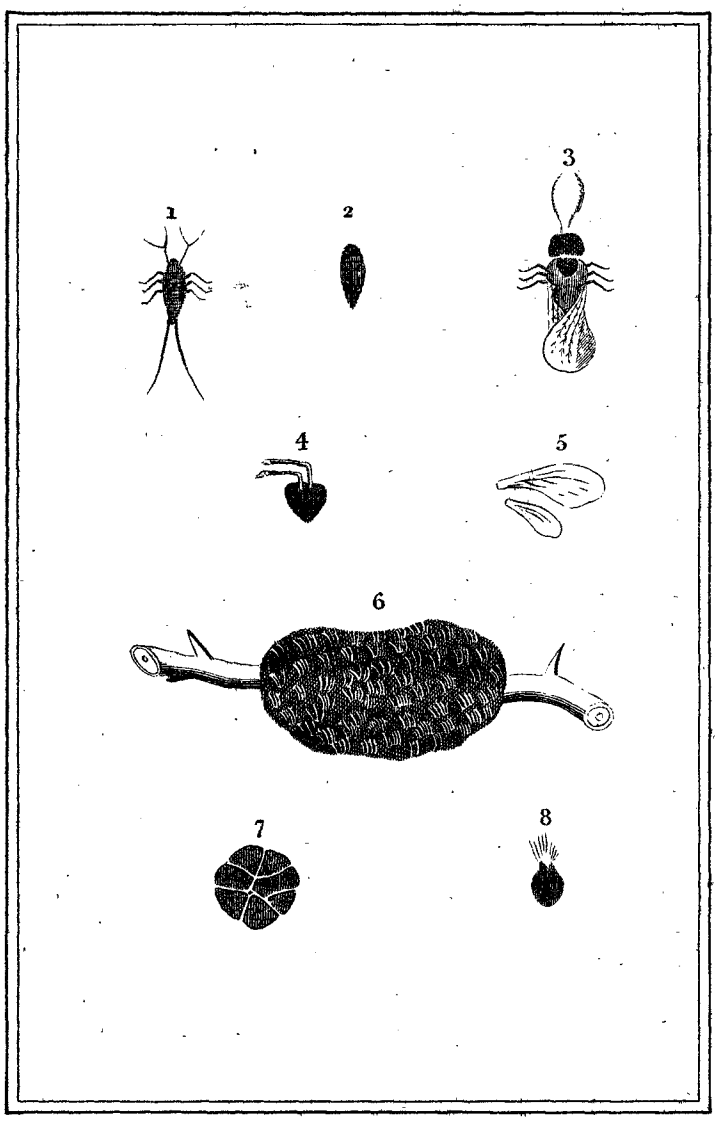
FORT ST. GEORGE, *January* 2, 1790.

XXIV.

ON THE LA'CSHA', OR LAC INSECT.

By Mr. W. ROXBURGH.

SOME pieces of very fresh-looking lac, adhering to small branches of *mimosa cinerea*, were brought me from the mountains on the 20th of last month. I kept them carefully, and to-day the 4th of *December*, fourteen days from the time they came from the hills, myriads of exceedingly minute animals were observed creeping about the lac, and branches it adhered to, and more still issuing from small holes over the surface of the cells: other small and perforated excrescences were observed with a glass amongst the perforations, from which the minute insects issued, regularly two to each hole, and crowned with some very fine white hairs. When the hairs were rubbed off, two white spots appeared. The animals, when single, ran about pretty briskly, but in general they were so numerous as to be crowded over one another. The body is oblong, tapering most towards the tail, below plain, above convex, with a double, or flat margin: laterally on the back part of the thorax are two small tubercles which may be the eyes: the body behind the thorax is crossed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croſſed with twelve rings: legs ſix: feelers (antennæ) half the length of the body, jointed, hairy, each ending in two hairs as long as the antennæ: rump, a white point between two terminal hairs, which are as long as the body of the animal. The mouth I could not ſee. On opening the cells, the ſubſtance that they were formed of cannot be better deſcribed, with reſpect to appearance, than by ſaying it is like the tranſparent amber, that beads are made of: the external covering of the cells may be about half a line thick, is remarkably ſtrong and able to reſiſt injuries: the partitions are much thinner: the cells are in general irregular ſquares, pentagons and hexagons, about an eighth of an inch in diameter, and $\frac{1}{4}$ deep: they have no communication with each other: all thoſe I opened, during the time the animals were iſſuing, contained in one half, a ſmall bag filled with a thick red jelly-like liquor replete with what I take to be eggs; theſe bags, or utriculi, adhere to the bottom of the cells, and have each two necks, which paſs through perforations in the external coat of the cells, forming the forementioned excreſcences, and ending in ſome very fine hairs. The other half of the cells have a diſtinct opening, and contain a white ſubſtance, like ſome few filaments of cotton rolled together, and numbers of the inſects themſelves ready to make their exit: ſeveral of the ſame inſects I obſerved to have drawn up their legs and to lie flat: they did not move on being touched, nor did they ſhow any ſigns of life with the greateſt irritation.

December 5. The ſame minute hexapedes continue iſſuing from their cells in numbers; they are more lively, of a deepened red colour, and fewer of the motionleſs ſort. To day I ſaw the mouth: it is a flattened point about the middle of the breaſt, which the little animal projects on being compreſſed.

December 6. The male inſects I have found to-day: a few of them are conſtantly running among the females moſt actively: as yet they are ſcarce more, I imagine, than one to 5000 females, but twice their ſize. The head is obtuſe; eyes black, very large; antennæ clavated, feathered, about $\frac{2}{3}$ the length of the body: below the middle an articulation, ſuch as thoſe in the legs: colour between the eyes a beautiful ſhining green: neck very ſhort: body oval, brown: abdomen oblong, the length of body and head: legs ſix: wings membranaceous, four, longer than the body, fixed to the ſides of the thorax, narrow at their inſertions, growing broader for $\frac{2}{3}$ of their length, then rounded: the anterior pair is twice the ſize of the poſterior: a ſtrong fibre runs along their anterior margins: they lie flat like the wings of a common flie, when it walks or reſts: no hairs from the rump: it ſprings moſt actively to a conſiderable diſtance on being touched: mouth in the under part

of

of the head: maxillæ tranſverſe. To-day the female inſects continue iſſuing in great numbers, and move about as on the 4th.

December 7. The ſmall red inſects ſtill more numerous, and move about as before: winged inſects, ſtill very few, continue active. There have been freſh leaves and bits of the branches of both mimoſa cinerea and corinda put into the wide mouthed bottle with them: they walk over them indifferently without ſhowing any preference nor inclination to work nor copulate. I opened a cell whence I thought the winged flies had come, and found ſeveral, eight or ten, more in it, ſtruggling to ſhake off their incumbrances: they were in one of thoſe utriculi mentioned on the 4th, which ends in two mouths, ſhut up with fine white hairs, but one of them was open for the exit of the flies; the other would no doubt have opened in due time: this utriculus I found now perfectly dry, and divided into cells by exceeding thin partitions. I imagine, before any of the flies made their eſcape, it might have contained about twenty. In theſe minute cells with the living flies, or whence they had made their eſcape, were ſmall dry dark coloured compreſſed grains, which may be the dried excrements of the flies.

NOTE *by the* PRESIDENT.

The *Hindus* have ſix names for *Lac*; but they generally call it *Lácſhà* from the *multitude* of ſmall inſects, who, as they believe, diſcharge it from their ſtomachs, and at length deſtroy the tree on which they form their colonies: a fine *Pippala* near *Criſhnanagar* is now almoſt wholly deſtroyed by them.

XXV.

THE SEVENTH ANNIVERSARY DISCOURSE, ON THE CHINESE.

—*See the Works of Sir William Jones, Vol. I. p.* 95.

XXVI.

THE TRANSLATION OF AN INSCRIPTION IN THE MAGA LANGUAGE ENGRAVED ON A SILVER PLATE FOUND IN A CAVE NEAR ISLAMABA'D.

Communicated by JOHN SHORE, *Esq.*

ON the 14th of *Mágha* 904, *Chándi Láh Rájà* *, by the advice of *Bowangarè Rauli*, who was the director of his ſtudies and devotions, and in conformity to the ſentiments of twenty-eight other *Raulis*, formed the deſign of eſtabliſhing a place of religious worſhip; for which purpoſe a cave was dug, and paved with bricks, three cubits in depth, and three cubits alſo in diameter, in which were depoſited one hundred and twenty brazen images of ſmall dimenſions, denominated *Tahmúdas*; alſo, twenty brazen images larger than the former, denominated *Lángúda*; there was likewiſe a large image of ſtone called *Lángúdagári*, with a veſſel of braſs in which were depoſited two of the bones of *T'hácur:* on a ſilver plate were inſcribed the *Hauca*, or the mandates of the deity; with that alſo ſtyled *Taumah Chuckſowna Tahma*, to the ſtudy of which twenty-eight *Raulis* devote their time and attention; who, having celebrated the preſent work of devotion with feſtivals and rejoicings, erected over the cave a place of religious worſhip for the *Magas* in honour of the deity.

God ſent into the world BUDDHA AVATA'R to inſtruct and direct the ſteps of angels and of men; of whoſe birth and origin the following is a relation: when BUDDHA AVATA'R deſcended from the region of ſouls in the month of *Mágh*, and entered the body of MAHA'MA'YA', the wife of SOOTAH DANNAH, *Rájà* of *Caïlàs*, her womb ſuddenly aſſumed the appearance of clear tranſparent cryſtal, in which BUDDHA appeared, beautiful as a flower, kneeling and reclining on his hands. After ten months and ten days of her pregnancy had elapſed, MAHA'MA'YA' ſolicited permiſſion from her huſband the *Rajà* to viſit her father, in conformity to which the roads were directed to be repaired and made clear for her journey; fruit-trees were planted; water veſſels placed on the road-ſide; and great illuminations prepared for the occaſion. MAHA'MA'YA' then commenced her journey, and ar-

* Perhaps, *Sándilyah.*

rived

rived at a garden adjoining to the road, where inclination led her to walk and gather flowers: at this time, being ſuddenly attacked with the pains of child-birth, ſhe laid hold on the trees for ſupport, which declined their boughs at the inſtant, for the purpoſe of concealing her perſon, while ſhe was delivered of the child; at which juncture BRAHMA' himſelf attended with a golden veſſel in his hand, on which he laid the child, and delivered it to INDRA, by whom it was committed to the charge of a female attendant; upon which the child, alighting from her arms, walked ſeven paces, whence it was taken up by MAHA'MA'YA' and carried to her houſe, and on the enſuing morning, news were circulated of a child being born in the *Rájà's* family. At this time TAPASWI *Muni*, who, reſiding in the woods, devoted his time to the worſhip of the deity, learned by inſpiration that BUDDHA was come to life in the *Rájà's* palace: he flew through the air to the *Rájà's* reſidence, where, ſitting on a throne, he ſaid, "I have repaired hither for the purpoſe of vi-"ſiting the child." BUDDHA was accordingly brought into his preſence: the *Muni* obſerved two feet fixed on his head, and, divining ſomething both of good and bad import, began to weep and to laugh alternately. The *Rájà* then queſtioned him with regard to his preſent impulſe, to whom he anſwered: "I muſt not reſide in "the ſame place with BUDDHA, when he ſhall arrive at the rank of AVATA'R: "this is the cauſe of my preſent affliction, but I am even now affected with gladneſs "by his preſence, as I am hereby abſolved from all my tranſgreſſions." The *Muni* then departed; and, after five days had elapſed, he aſſembled four *Pandits* for the purpoſe of calculating the deſtiny of the child; three of whom divined, that, as he had marks on his hand reſembling a wheel, he would at length become a *Rájà Chacraverti*; another divined, that he would arrive at the dignity of *Avatàr*.

The boy was now named SA'CYA, and had attained the age of ſixteen years; at which period it happened, that the *Rájà* CHUHIDA'N had a daughter named VASUTA'RA', whom he had engaged not to give in marriage to any one, till ſuch time as a ſuitor ſhould be found, who could brace a certain bow in his poſſeſſion, which hitherto many *Rájàs* had attempted to accompliſh without effect. SA'CYA now ſucceeded in the attempt, and accordingly obtained the *Rájà's* daughter in marriage, with whom he repaired to his own place of reſidence.

One day, as certain myſteries were revealed to him, he formed the deſign of relinquiſhing his dominion; at which time a ſon was born in his houſe whoſe name was RAGHU. SA'CYA then left his palace with only one attendant and a horſe, and, having

having croſſed the river GANGA', arrived at *Balúcáli*, where, having directed his ſervant to leave him and carry away his horſe, he laid aſide his armour.

When the world was created, there appeared five flowers, which BRAHMA' depoſited in a place of ſafety: three of them were afterwards delivered to the three *T'hácurs*, and one was preſented to SA'CYA, who diſcovered that it contained ſome pieces of wearing apparel, in which he clothed himſelf, and adopted the manners and life of a mendicant. A traveller one day paſſed by him with eight bundles of graſs on his ſhoulders, and addreſſed him, ſaying, "A long period of time has "elapſed, ſince I have ſeen the *T'hácur*; but now ſince I have the happineſs to "meet him, I beg to preſent him an offering conſiſting of theſe bundles of graſs." SA'CYA accordingly accepted of the graſs, and repoſed on it. At that time there ſuddenly appeared a golden temple containing a chair of wrought gold, and the height of the temple was thirty cubits, upon which BRAHMA' alighted, and held a canopy over the head of SA'CYA: at the ſame time INDRA deſcended with a large fan in his hand, and NA'GA, the *Rájà* of ſerpents with ſhoes in his hand, together with the four tutelar deities of the four corners of the univerſe; who all attended to do him ſervice and reverence. At this time likewiſe the chief of *Aſurs* with his forces arrived, riding on an elephant, to give battle to SA'CYA, upon which BRAHMA', INDRA, and the other deities deſerted him and vaniſhed. SA'CYA, obſerving that he was left alone, invoked the aſſiſtance of the Earth; who, attending at his ſummons, brought an inundation over all the ground, whereby the *Aſur* and his forces were vanquiſhed and compelled to retire.

At this time five holy ſcriptures deſcended from above, and SA'CYA was dignified with the title of BUDDHA *Avatàr*. The ſcriptures confer powers of knowledge and retroſpection, the ability of accompliſhing the impulſes of the heart, and of carrying into effect the words of the mouth. SA'CYA reſided here, without breaking his faſt, twenty-one days, and then returned to his own country, where he preſides over *Rájàs*, governing them with care and equity.

Whoever reads the *Cáric*, his body, apparel, and the place of his devotions muſt be purified; he ſhall be thereby delivered from the evil machinations of demons and of his enemies; and the ways of redemption ſhall be open to him. BUDDHA *Avatàr* inſtructed a certain *Rauli* by name ANGULI MA'LA in the writings of the *Cáric*, ſaying, "whoever ſhall read and ſtudy them, his ſoul ſhall not undergo a tranſmigration," and the ſcriptures were thence called *Anguli Málà*. There were likewiſe five other books of the *Cáric* denominated *Vachanam*, which if any one

peruſe

peruſe, he ſhall thereby be exempted from poverty and the machinations of his enemies; he ſhall alſo be exalted to dignity and honours, and the length of his days ſhall be protracted: the ſtudy of the *Cáric* heals afflictions and pains of the body, and whoever ſhall have faith therein, heaven and bliſs ſhall be the reward of his piety.

XXVII.

A SUPPLEMENT TO THE ESSAY ON INDIAN CHRONOLOGY. *See the Works of Sir William Jones, Vol. I. p. 315.*

XXVIII.

ON THE SPIKENARD OF THE ANCIENTS. *See the Works of Sir William Jones, Vol. II. p. 9.*

APPENDIX.

A METEOROLOGICAL DIARY,

KEPT AT CALCUTTA,

By HENRY TRAIL, Esq.

From 1ſt February 1784, to 31ſt December 1785.

REMARKS.

IN the following Diary of the Weather, begun the 1st of February 1784, every change in the air was marked down with the greateſt preciſion three times every day, and always nearly at the ſame hours, viz. at ſun-riſing at three, or half paſt three o'clock in the afternoon, and at eleven o'clock at night.

While the wind continued ſoutherly, the Thermometer was placed in a Verandah open to the Eſplanade, where there was at all times a free circulation of air; and when the wind became northerly, the inſtrument was removed to the oppoſite ſide of the houſe, and equally expoſed, as in the preceding part of the year.

The Barometer continued always in the ſame place.

The Hygrometer made uſe of, was a bit of fine ſponge, ſuſpended in a ſcale (on the end of a ſteel-yard) firſt prepared for more eaſily imbibing the moiſture, by dipping it in a ſolution of Salt of Tartar, afterwards drying it well, and bringing it to an equilibrium by a weight in the oppoſite ſcale, at a time when the atmoſphere appeared to have the leaſt degree of moiſture.

A ſemicircular ſcale at the top, divided from 0 to 90° on each ſide, with the needle of the yard, pointed out the quantity of moiſture gained or loſt daily; but in the following Diary the degrees of moiſture have ſeldom been taken down.

Every fall of rain was likewiſe taken, and the quantity in cubick inches daily noted down.

The winds were alſo obſerved, and the figures 0, 1, 2, 3, 4, denote the force thereof.

Here it may be remarked, that at ſun-riſing, there is ſeldom or ever any wind; but no ſooner is the air a little rarefied by its rays, than a little breeze begins, and this generally increaſes till about noon, when again it begins to loſe its force, and dies away, from the ſame cauſe.

In order to aſcertain the influence of the Moon upon the weather, the mean temperature, as well as the weight of the atmoſphere of each quarter, is accurately marked down by taking in the three days preceding, and the three days after the change with the intermediate day. From theſe, the denſity is diſcovered, by the following rule given by Dr. *Bradely*, viz.

A, altitude of barometer; B, altitude of thermometer; D, denſity.

$$\frac{A}{B + 350} = D\text{—or denſity.}$$

N. B. In this, the mean morning denſity is only taken. However, the mean denſity for the whole may be found by the ſame rule.

January 1, 1785. From an examination of one year's obſervations on the influence of the Moon on the mercury in the Barometer, it does not appear that there is any certain rule to be laid down regarding it. However, it may be affirmed that the direction of the winds has more effect upon it, as we never fail to ſee the mercury higheſt when the wind blows from the NW; in a leſſer degree from the N, and loweſt of all when it proceeds from the SE quarters.

A GENERAL STATE *of the* WEATHER, *for* FEBRUARY 1784.

	M.	N.	E.	
Greateſt altitude of the Thermometer,	75°	86	76	
Leaſt ditto,	66	70	68	74⅔ Mean temperature.
Mean ditto,	74	79	73	

Clear, 3 days.
Cloudy, 26 do.
N° days on which it rained, 8 do.
Quantity of rain. 4.2 Inch.

THIS month, the wind very variable, and the atmoſphere for the moſt part cloudy, and ſometimes ſeveral days ſucceeding without any ſun—the air alſo damp and cold. Frequently thunder; and on the 8th, there was a fall of hail in the afternoon accompanied with thunder.

THE mornings generally foggy.

CALCUTTA, FEBRUARY 1784.

Day.	Thermometer. M.	N.	E.	Mean morning denſity, of each quarter of the Moon.	Rain Inch	Wind. Point.	Force	Appearance of the air.	REMARKS.
1	68	75	72			W	0	Cloudy,	SUNDAY.
2	68	78	72			N	0	ditto,	Heavy, with a great appear-
3	67	74	69			NE	0	ditto,	ance of rain.
4	68	77	68			S	0	ditto,	Ditto.
5	71	79	72			SW	1	ditto,	Ditto.
6	72	80	74	Full M. 70 3/7		NW	1	ditto,	A thick fog all day.
7	71	82	75			S	2	Clear,	
8	70	80	74		.1		1	Cloudy,	Some hail in the afternoon
9	74	80	75				2	ditto,	with thunder.
10	75	80	74				2	ditto,	A great appearance of rain;
11	71	77	75				1	ditto,	very dark.
12	73	79	76		.2	NW	1	ditto,	Ditto few drops of rain
13	73	80	74		.1	S	3	ditto,	Ditto ditto.
14	74	80	75	L. Q. 71 6/7	.1	NW	2	ditto,	Ditto ditto
15	70	82	72				1	ditto,	Much thunder this morning
16	72	78	74		0.5	S	2	ditto,	with a heavy ſhower.
17	70	81	72				0	Clear,	
18	69	76	72			var.	1	Hazy,	
19	69	79	74			S	0	ditto,	A few drops of rain.
20	70	77	75			W	2	ditto,	
21	73	77	74	New M. 70 3/7			1	Cloudy,	Very gloomy, and a great
22	70	75	73			N	0	Hazy,	appearance of rain; very
23	70	83	75			W	0	ditto,	cloſe, no ſun all day.
24	72	84	74				0	Cloudy,	Ditto.
25	71	76	73		0.5		1	ditto,	Clear at intervals.
26	68	70	68		.2		0	ditto,	Ditto.
27	67	74	69			NW	0	ditto,	Very thick.
28	67	79	71	F. Q. 67 2/7	.1	W	1	ditto,	Thunder, very moiſt and wet.
29	66	78	71			NW	2	Clear,	Very chilly.
mean	72	79	73		4.2	var.	2	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE *of the* WEATHER, *for* MARCH.

	M.	*N.*	*E.*	
Greateſt altitude of Thermometer,	84	89	85	79¾ Mean temperature.
Leaſt ditto,	66	75	71	
Mean ditto,	75	84	79	

Clear, 16 days.
Cloudy, 15 do.
Rain, 3 do.
Quantity of do. 1-8 inch.

THE wind almoſt continually ſoutherly, and ſtrong blaſts towards the end of the month—the weather throughout clear and ſerene, and heavy dews at night, which indeed muſt always be the caſe, when they are preceded by a clear warm ſun.

IN blowing weather dews are ſeldom ſeen, the moiſture as it falls being diſpelled by the wind.

THE heat of the earth this month, about mid-day, about 120°.

CALCUTTA, MARCH 1784.

Day.	*Thermometer.* M	N	E	*Mean morning heat, at each quarter of the Moon.*	*Rain Inch*	*Wind.* Point.	Force	*Appearance of the air.*	*REMARKS.*
1	66	80	71			SW	1	Clear,	MONDAY.
2	67	80	71			W	1	ditto,	Moiſt.
3	70	82	76			S	2	ditto,	Thunder, but no rain.
4	72	85	76		1	W	4	Cloudy,	Thunder, early this morning.
5	73	84	74			SE	0	Hazy,	
6	71	83	74				2	Cloudy,	
7	70	78	74	Full M. 70 5/7			1	ditto,	Great appearance of rain.
8	69	75	74			S	1	Clear,	
9	70	80	74				1	ditto,	The weather very fine and dry
10	70	82	75				0	ditto,	Ditto.
11	70	83	75			var.	2	ditto,	Ditto.
12	69	85	75				1	ditto,	Ditto.
13	70	88	79			S	3	ditto,	Ditto.
14	75	86	81	L. Q. 73 6/7			1	ditto,	The morning foggy.
15	76	86	80				0	Cloudy,	Very cloſe and ſultry.
16	79	86	81				0	Clear,	Ditto.
17	78	86	81				0	ditto,	Ditto.
18	79	87	83			var.	0	Hazy,	Ditto.
19	80	88	83				3	Clear,	The wind high.
20	80	86	82		0.3		3	Cloudy,	Ditto thunder.
21	77	85	83	New M. 79 3/7		W	3	ditto,	Ditto.
22	80	86	83			S	2	Clear,	
23	80	88	84				0	Cloudy,	Moiſt.
24	80	89	83				1	ditto,	Do.
25	81	88	85				1	ditto,	Very thick.
26	83	89	84			var.	1	ditto,	A great appearance of rain.
27	84	86	80		0.5	S	4	ditto,	The wind boiſterous.
28	77	82	81	F. Q. 80 2/7			3	ditto,	Ditto.
29	78	81	81				2	ditto,	Ditto.
30	79	86	83				1	Clear,	
31	80	84	81				1	ditto,	
mean	75	84	79		1.8	S	3	Clear.	Mean ſtate of the atmoſphere.

A GENERAL STATE of the WEATHER, for APRIL 1784.

	M.	N.	E.	
Greateſt altitude of the Thermometer,	86	97	87	86⅓ Mean temperature.
Leaſt ditto,	71	87	79	
Mean ditto,	83	91	85	

Clear, 14 days.
Cloudy, 16 ditto,
Rain, 6 ditto,
Quantity of ditto, 3-1 inch.

THE prevailing Wind this month, as well as the former, South; the mean heat of the earth at mid-day, 126°. Blowing and heavy weather in general, and frequent thunder ſtorms about the end, although many of the nights were cloſe and ſultry.

THE thunder ſtorms that generally prevail at this time of the year, always happen in the afternoon or evening, and come from the NW, and are attended with loud peals and heavy fall of rain. Before theſe ſtorms begin, the clouds become very dark and low, and the winds being thus confined between the clouds and earth, muſt, of courſe, be greatly augmented.

CALCUTTA, APRIL 1784.

Day.	Thermometer. M.	N.	E.	Mean morning heat, at each quarter of the Moon.	Rain.	Wind. Point.	Force	Appearance of the air.	REMARKS.
1	79	89	85			S	1	Clear,	THURSDAY.
2	81	87	83				0	ditto,	
3	81	91	85				4	Cloudy,	Diſagreeable blowing weather.
4	83	89	85				3	ditto,	Ditto.
5	83	89	86				3	ditto,	Ditto.
6	83	88	85	Full M. 82 6/7			4	Cloudy,	Ditto.
7	83	91	86				3	Hazy,	Ditto.
8	83	91	85				2	Clear,	
9	84	92	86				1	ditto,	
10	84	94	87				0	ditto,	
11	85	97	87				0	ditto,	The night very cloſe.
12	86	95	87				0	ditto,	Ditto.
13	85	93	85	L. Q. 84 3/7			0	ditto,	Hard blowing weather with much duſt.
14	86	92	83			SE	3	ditto,	
15	83	91	85			S	3	Cloudy,	Ditto.
16	83	90	86		0.4		3	ditto,	A heavy thunder ſtorm, in the evening.
17	84	89	80		1.5		4	ditto,	
18	80	88	79		0.5		2	ditto,	High wind.
19	74	87	85			SW	3	ditto,	Very cloſe.
20	83	90	85	New M. 81 3/7		NW	0	Clear,	Strong wind.
21	83	91	86			S	3	ditto,	Ditto.
22	83	92	85				3	ditto,	And cloſe and ſultry.
23	83	93	87				0	Hazy,	
24	83	92	86				3	Clear,	
25	84	90	86				3	ditto,	With rain and thunder.
26	84	89	84		0.4		4	Cloudy,	Ditto, from NW.
27	80	88	85	F. Q. 83 3/7	0.2		4	ditto,	Ditto, Ditto.
28	83	90	86				2	ditto,	Ditto.
29	85	88	85		0.1		0	ditto,	High wind.
30	84	89	85				3	ditto,	
mean	83	91	85		3.1	S	4	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE *of the* WEATHER, *for* MAY 1784.

	M.	*N.*	*E.*	
Greateſt altitude of the Thermometer,	85	93	88	
Leaſt ditto,	75	82	74	$84\frac{2}{3}$ Mean temperature.
Mean ditto,	81	89	84	

Clear, 7 days.
Cloudy, 24 ditto.
Rain, 14 ditto.
Quantity of ditto, 9·6 inches.

THE Wind ſoutherly, with a few pretty violent ſtorms from the NW, at the beginning of the month, while the latter part was cloſe, gloomy, and warm; but, in general, the whole month was exceedingly cloudy, and ſcarcely a ſingle day of bright ſun ſhine.

THE Rains began on the 22d, and from that day to the end the nights were very cloſe and ſultry and the air very damp.

CALCUTTA, MAY 1784.

Day.	*Thermometer.* *M.*	*N.*	*E.*	*Mean morning heat, at each quarter of the Moon.*	*Rain.*	*Wind.* *Point.*	*Force.*	*Appearance of the air.*	*REMARKS.*
1	82	86	82		2.	S	3	Cloudy,	SATURDAY, a violent ſtorm.
2	77	88	74		1.		3	ditto,	Very heavy. Ditto, no ſun.
3	75	82	79		0.6		4	ditto,	Ditto.
4	78	87	84				1	Hazy,	And cloſe.
5	82	89	84	Full M. $79\frac{6}{7}$			1	ditto,	No ſun all day.
6	81	90	85		0.5		2	ditto,	A thunder ſtorm in the evening.
7	84	90	85				3	ditto,	High wind at times.
8	82	90	86				3	Clear,	Ditto.
9	83	90	87				2	Hazy,	
10	84	90	87		0.4		3	Cloudy,	Very thick and dark.
11	85	89	78			SE	2	ditto,	
12	75	88	84	L. Q. $79\frac{6}{7}$	0.8	E	2	ditto,	A thunder ſtorm in the evening.
13	77	85	80		2.	S	1	ditto,	
14	75	85	83			var.	0	ditto,	No wind.
15	80	88	84			S	0	Clear,	
16	80	90	83		0.2		1	ditto,	Thunder in the evening.
17	78	91	86				0	ditto,	The weather very cloſe and ſtill.
18	83	91	87				0	ditto,	Ditto.
19	84	90	87	New M. $82\frac{6}{7}$			1	ditto,	Ditto.
20	85	92	87				1	Cloudy,	At intervals.
21	85	93	88				0	Clear,	Very ſtill.
22	85	91	85		0.6		2	Cloudy,	Thunder in the evening.
23	84	90	83		0.4		2	ditto,	Ditto.
24	82	89	85				2	ditto,	Ditto.
25	83	92	86		0.2		1	ditto,	Ditto.
26	84	86	84		0.1		2	ditto,	Ditto.
27	81	82	83	F. Q. $81\frac{6}{7}$	0.2	SE	2	ditto,	Ditto.
28	80	86	83			NW	3	ditto,	A great appearance of rain.
29	81	89	84		0.4	NW	2	ditto,	The nights very ſultry.
30	82	89	85			NW	3	ditto,	Ditto.
31	83	92	86		0.2	S	2	ditto,	Thunder ditto.
mean	81	89	84		9.6	S	2	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE *of the* WEATHER, *for* JUNE 1784.

	M.	*N.*	*E.*	
Greateſt altitude of the Thermometer,	84	90	86	83 Mean temperature.
Leaſt ditto,	77	80	78	
Mean ditto,	81	85	83	

Clear, 1 day.
Cloudy, 29 days.
Rain, 14 ditto.
Quantity of ditto, 17-4 inches.

THE wind, this month, inclining ſometimes to the E of S. The atmoſphere exceedingly moiſt and wet, and much rain from the 10th to 17th, the ſky moſtly clouded throughout, and very little variation in the temperature of the air.

CALCUTTA, JUNE 1784.

Day.	*Thermometer.* *M.*	*N.*	*E.*	*Mean heat at each quarter of the Moon.*	*Rain.*	*Wind.* *Point.*	*Force*	*Appearance of the air.*	*REMARKS.*
1	82	82	82		0.7	S	1	Cloudy,	TUESDAY, thunder.
2	80	86	84		1.2		1	ditto,	
3	82	84	83				1	ditto,	
4	82	85	82	Full M. 81 3/7	0.2		1	ditto,	A gentle ſhower.
5	81	87	85			var.	0	ditto,	Cloſe.
6	82	90	85				0	ditto,	
7	83	85	84		0.5		1	ditto,	
8	81	84	82		1.6	NE	1	ditto,	Several ſhowers.
9	80	84	83				0	ditto,	
10	81	83	82	L. Q. 80 1/7	1.1		0	ditto,	No ſun all day.
11	79	80	80		1.6	S	1	ditto,	Inceſſant rain all day.
12	78	78	78		4.6		3	ditto,	Ditto
13	77	80	80		0.1		1	ditto,	
14	80	85	80		0.4		2	ditto,	Thunder in the evening.
15	81	85	82		0.1	W	2	Hazy,	No ſun all day.
16	80	82	79		2.5	var.	1	Cloudy,	Ditto.
17	80	83	83		0.8	S	0	ditto,	Ditto.
18	81	89	85	New M. 81 1/7			1	Hazy,	Ditto.
19	81	88	85				1	ditto,	Sun very faint.
20	82	88	86				1	ditto,	Very thick and no ſun.
21	84	90	85			SE	1	ditto,	The nights very cloſe.
22	84	88	85			SE	1	ditto,	Ditto.
23	82	88	85				1	ditto,	Ditto.
24	82	90	84				1	ditto,	Ditto.
25	83	90	86			var.	0	ditto,	Ditto.
26	83	89	84	F. Q. 82		SE	0	Cloudy,	Ditto.
27	82	87	84			S	0	Hazy,	Ditto.
28	83	87	83				0	Cloudy,	
29	81	81	81		2 1	var.	1	ditto,	Thunder.
30	81	88	83			S	3	Clear,	High wind.
mean	81	85	83		17.4	S&SE	1	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE *of the* WEATHER, *for* JULY 1784.

	M.	*N.*	*E.*	
Greateſt altitude of Thermometer,	84	90	85	83 Mean temperature.
Leaſt ditto,	77	77	78	
Mean ditto,	81	85	83	

Clear, 1 day.
Cloudy, 30 days.
Rain, 20 ditto.
Quantity of ditto, 15 Inches.

THE prevailing wind SE, and the atmoſphere, as the former month, exceeding thick and humid; and very little ſun ſhine. The mean temperature, exactly the ſame as laſt month, and very little variation between the heat at mid-day, and that of the morning and evening.

DURING the rains, the wind is often variable, but commonly it comes round to the Eaſtward when there falls much rain.

CALCUTTA, JULY 1784.

Day.	*Thermometer.* *M*	*N.*	*E.*	*Mean morning heat, at each quarter of the Moon.*	*Rain.*	*Wind.* *Point.*	*Force.*	*Appearance of the air.*	*REMARKS.*
1	81	89	84	THURSDAY.		S	3	Clear,	The wind ſtrong in the morning,
2	83	88	84				2	Cloudy,	but the nights very ſtill and
3	83	83	83			SE	2	ditto,	cloſe.
4	80	86	84	Full M. 82			3	ditto,	
5	84	89	84				2	Hazy,	
6	84	88	84		0.4		1	Cloudy,	The night very bright.
7	83	85	84				0	ditto,	Ditto thunder.
8	82	85	84		0.3		0	ditto,	Ditto.
9	82	86	84	L. Q. 82 $\frac{2}{7}$	0.1		1	ditto,	Ditto.
10	82	90	85		0.1		1	ditto,	Much lightning in the evening.
11	83	86	83		1.1	var.	1	ditto,	
12	82	86	84		0.9		1	ditto,	Several ſmall ſhowers.
13	83	86	84		0.3		2	ditto,	
14	81	84	82		0.2		1	ditto,	
15	79	83	82		2.6		1	ditto,	Rained all day.
16	82	83	82			SE	0	ditto,	
17	78	83	82	New M. 79 $\frac{5}{7}$	0.9		1	ditto,	Small rain, very dark.
18	79	85	82		0.1		2	ditto,	On the 7th, there had been no
19	79	84	82		0.1		1	ditto,	rain at Chunar, many per-
20	80	85	81			S	3	ditto,	ſons ſick, but chiefly among
21	77	83	80		0.1	SE	1	ditto,	the Natives.
22	79	84	82		0.3		1	ditto,	
23	80	85	79		1.7		0	ditto,	Much thunder and lightning.
24	79	83	80				1	ditto,	
25	79	83	81	F. Q. 79 $\frac{6}{7}$	0.1	E	1	ditto,	
26	80	86	82		0.1	SE	1	ditto,	Thunder.
27	81	86	83		0.2		1	ditto,	
28	81	86	84			SW	1	ditto,	
29	83	86	83			S	3	ditto,	High winds.
30	81	82	79		1.8	SW	1	ditto,	Thunder.
31	78	77	78		3.6		1	ditto,	Rain all day.
mean	81	85	83		15.	S & SE	1	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE of the WEATHER, for AUGUST 1784.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude,	83°	89°	84°	82 ⅔ Mean temperature.
	Leaſt ditto,	77	80	80	
	Mean ditto,	81	85	82	
BAROMETER,	Greateſt ditto, in.	29.75	29.75	29.76	Mean ſtate of the atmoſphere—29.57.
	Leaſt ditto,	29.57	29.56	29.61	
	Mean ditto,	29.67	29.66	29.70	
	Greateſt variation,	.18	.19	.15	
	Mean denſity,	.688	.682	.688	686 denſity.
HYGROMETER,	Greateſt moiſture,	50°	45°	45°	
	Ditto drought,	15	10	10	
	Mean drought and moiſture,	3d 28m	1d 18m	1d 15m	

Clear - - - 5 days.
Cloudy, - - 26 ditto.
Rain, - - - 23 ditto.
Quantity ditto, 16-9 inches.

THE air ſtill very moiſt, and very little ſun ſhine, although the nights in general were very bright and fine: frequent thunder, and on the 22d, an exceeding loud peal early in the morning. The quantity of rain that fell this month was very conſiderable, and every thing imbibing the moiſture to the higheſt degree.

THE Barometer is almoſt invariably higher at night than in the morning, and loweſt always at mid-day. The air being much loaded with moiſture, the whole of this month, the variation of the mercury was very inſenſible. The ſame cauſes keep the Thermometer nearly ſtationary alſo.

CALCUTTA, AUGUST 1784.

Day.	Thermometer. M	N	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	m.	N. d.	m.	E. d.	m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	77	83	80	F. M.	29.64	29.64	29.73	10	15	10				1.2	S	0	1	0	Cloudy,
2	80	86	82	SUN-	.69	.69	.73		15	5				0.4		0	1	0	ditto,
3	81	86	83	DAY.	.70	.63	.70	15	20		20					1	1	1	ditto,
4	82	88	83		.66	.64	.66	15	25		20			0.4	SE	0	1	0	Clear,
5	82	86	83		.64	.63	.71	15	30		15			0.3	E	1	1	0	Cloudy,
6	81	86	83		.70	.70	.75	12	30	0	0			0.1	SE	1	1	1	ditto,
7	82	86	83	L. Q.	.75	.70	.74	10	40		5			0.2		0	1	0	ditto,
8	81	89	84	687	.74	.72	.72	10	35		10				S	1	2	1	Clear,
9	82	87	83		.70	.70	.73	15	35		30					0	1	0	ditto,
10	82	87	83		.73	.73	.75	40	40		30		30			1	0	1	ditto,
11	83	82	83		.72	.72	.73		40		40		40	0.4		1	2	0	Cloudy,
12	82	83	81		.70	.72	.74		45	2			8	0.7	SE	1	2	0	ditto,
13	81	87	83		.72	.72	.76		15	10			10			0	1	1	ditto,
14	81	83	81		.73	.73	.77		20		20	10		0.8		1	1	0	ditto,
15	81	83	81		.74	.72	.74		10		35		25	0.7	S	0	0	0	ditto,
16	79	84	82	N. M.	.70	.60	.64		40		35		25	1.5	SE	1	0	0	ditto,
17	81	83	80	689	.60	.56	.61		25		40		30	2.5		1	1	0	ditto,
18	79	83	80		.58	.56	.64		45		30		40	2.8		0	2	1	ditto,
19	77	80	80		.65	.69	.74		45		45		30	0.8		1	1	1	ditto,
20	78	84	81		.74	.75	.72		40		35		45	0.5		1	2	2	ditto,
21	79	87	83		.72	.63	.69		50		15		35		SW	0	1	0	Clear,
22	80	86	83		.65	.64	.69		45		25		12	1.9		2	0	0	Hazy,
23	82	87	83	F. Q.	.67	.61	.67		30	0	0		20	0.2	S	0	0	0	Cloudy,
24	82	87	84	689	.64	.59	.66		30	0	0		5		SE	0	1	0	ditto,
25	83	86	84		.64	.64	.64		15	8			5	0.2	E	0	1	1	ditto,
26	81	85	81		.60	.56	.63		10		5	10		0.3	SE	2	2	1	ditto,
27	80	84	81		.60	.59	.62		8		5		6	0.1		2	3	2	ditto,
28	80	85	83		.59	.64	.65		10		15		20	0.2		2	3	2	ditto,
29	81	87	83	F.M.	.64	.68	.68		33	0	0		5	0.6	SW	3	3	3	ditto,
30	81	85	83	688	.66	.66	.69		20		15		10		SW	2	2	2	ditto,
31	80	84	83		.66	.69	.74		25		25		35	0.1	S	2	2	1	ditto.
mean	81	85	82		29.67	29.66	29.70	3	28	1	18	1	15	16.9	S&SE	1	1⅓	⅔	Cloudy.

A GENERAL STATE *of the* WEATHER, *for* SEPTEMBER 1784.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude,	84°	90°	85°	82½ Mean temperature.
	Leaſt ditto,	76	77	78	
	Mean ditto,	80	85	81½	
BAROMETER,	Greateſt ditto, in.	29.95	29.90	29.97	Mean ſtate of the atmoſphere—29.81.
	Leaſt ditto,	29.72	29.68	29.75	
	Mean ditto,	29.81	29.80	29.83	
	Greateſt variation,	0.23	0.22	0.22	
	Mean denſity,	.693	.685	.692	.690 denſity.
HYGROMETER,	Greateſt moiſture,	60°	60°	60°	
	Ditto drought,	10	40	25	
	Mean denſity and moiſture,	½d 24m	10d 14m	5d 15m	

Clear, - - - 10 days,
Cloudy, - - - 20 ditto.
Rain, - - - 12 ditto.
Quantity ditto, - 11-3 inches.

THE wind generally S and SE, much lightning in the evenings but not attended either with rain or thunder. The air ſtill damp and cloudy, although the Barometer ſtood conſiderably higher than the preceding month.

IT is worthy of obſervation, that upon the rains going off, the water falls in larger drops than at any other period of the ſeaſon, and probably this may be occaſioned from the height it has to fall: and in proof of this, the oppoſite ſtations of the Barometer need only be conſulted, where it appears, that the weight of the atmoſphere was greatly increaſed about the laſt period of the rains.

CALCUTTA, SEPTEMBER 1784.

Day.	*Thermometer.* M.	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m.	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	81	86	83	WED.	29.72	29.72	29.79		40		5		20		S	0	1	1	Cloudy,
2	81	89	84		.79	.82	.84		25	5			5		SE	0	1	0	Clear,
3	83	83	82		.84	.81	.84		25		20		25	2.0	SW	0	1	0	Cloudy,
4	81	87	83		.82	.78	.76		35		20		15			1	1	1	Hazy,
5	81	88	83		.74	.78	.75		30		20		20			1	1	0	ditto,
6	82	89	83	L. Q.	.75	.77	.78		20		20		5			0	1	1	Cloudy,
7	81	89	83	691	.77	.82	.81		25	15	0		20		S	1	1	1	Clear,
8	81	88	83		.80	.83	.80		15	12		10			S	0	1	1	ditto,
9	82	89	84		.79	.72	.78		5	30		5			SW	0	2	0	ditto,
10	82	90	83		.76	.72	.78		5	35		20			SE	0	1	2	ditto,
11	84	90	85		.78	.78	.81	10		40		25			NE	0	2	1	ditto,
12	84	87	84		.81	.80	.79		0	20		20		0.5		0	1	0	Cloudy &
13	81	87	83		.77	.75	.76		25	20		20			N	1	1	0	heavy,
14	82	84	82	N. M.	.72	.68	.78		15	10		10			NE	1	1	1	ditto,
15	77	82	80	691	.77	.80	.80		15	0	0	0		0.7	SE	1	1	1	ditto,
16	79	81	81		.78	.80	.76		20		5		15	0.3		1	1	1	ditto,
17	79	80	79		.93	.70	.78		18		25		30	1.5		1	2	1	ditto,
18	77	81	78		.79	.77	.84		35		38		38	0.9		0	1	1	ditto,
19	76	77	78		.84	.89	.87		50		53		55	1.2		1	1	1	ditto,
20	78	80	79		.88	.89	.91		60		60		55	1.1		1	0	1	ditto,
21	78	80	78		.92	.89	.95		60		55		60	0.3	SE	1	1	1	ditto,
22	79	80	80	F. Q.	.95	.90	.97		60		45		45	1.1	E	1	0	0	ditto,
23	78	83	80	698	.94	.88	.92		45		30		35	0.1	SE	0	1	0	ditto,
24	79	84	80		.92	.84	.88		40		20		30		S	0	1	0	ditto,
25	79	85	80		.88	.84	.86		35		0		5		SE	0	1	0	ditto,
26	78	86	82		.87	.84	.86		20	20		5			SE	0	1	1	Clear,
27	80	83	79		.80	.84	.80		5		0	5		1.6	var.	0	2	1	Cloudy,
28	79	85	82	F. M.	.80	.77	.83		15	20		5			S	0	2	1	Clear,
29	80	88	84	694	.84	.81	.89		10	35		20			SE	0	1	1	ditto,
30	83	89	83		.89	.87	.93	5		35		15				0	1	0	ditto,
mean	80	85	81½		29.81	29.80	29.83	½	24	10	14	5	15	11.3	SE & S	½	1	⅓	Cloudy.

A GENERAL STATE *of the* WEATHER, *for* OCTOBER 1784.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude,	83	90	85	82 ½ Mean temperature.
	Leaſt ditto,	74	77	76	
	Mean ditto,	79	86½	82½	
BAROMETER,	Greateſt ditto, in.	30.04	30.00	30.02	Mean ſtate of the atmoſphere. — 29.91
	Leaſt ditto,	29.74	29.77	29.76	
	Mean ditto,	29.92	29.91	29.92	
	Greateſt variation,	0.30	0.23	0.26	
	Mean denſity,	.697	.686	.693	.692 denſity,
HYGROMETER,	Greateſt moiſture,	48	25	30	
	Ditto drought,	30	50	45	
	Mean moiſture and drought,	5d 7m	30d 1m	22d 2m	

Clear,	19	days,
Cloudy,	12	ditto,
Rain,	3	days,
Quantity of ditto,	0·8	inches,

THE air very clear and elaſtic, and heavy dews at night. The Barometer very high, and the wind W and NW.

ABOUT the middle of the month, the mornings became a little foggy, which indicates the approach, or beginning, of the cold ſeaſon: The atmoſphere thin and dry, and cleared of its vapours; of courſe the mercury roſe in the Barometer.

As the difference between the day and the night heat begins now to be greater than in any of the eight preceding months, the fogs we have at this ſeaſon of the year are by that means formed.

CALCUTTA, OCTOBER 1784.

Day.	*Thermometer.* M	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	83	89	82	FRI.	29.91	29.93	29.93	3		35		10		0.6	SE	0	3	1	Cloudy,
2	81	82	80		.94	.90	.92		10	15		0		0.1	S	1	3	1	ditto,
3	80	85	83		.90	.83	.87		15	15		5			SE	0	1	1	ditto,
4	80	88	84		.83	.77	.86		15	25		15			S	0	2	0	ditto,
5	82	88	84		.78	.78	.78		5	25		15			NE	0	3	0	ditto,
6	81	90	83	L. Q.	.76	.78	.76		0	20		15		0.1	var.	0	1	1	Clear,
7	82	87	82	692	.74	.77	.77	5		20		15				0	1	1	ditto,
8	82	88	83		.77	.77	.83	5		40		35			W	0	1	0	Cloudy,
9	80	89	82		.83	.87	.86	10		40		35			W	1	1	0	Clear,
10	79	89	82		.88	.87	.86	15		40		35				0	1	0	ditto,
11	99	90	83		30.03	.96	30.	15		40		30				0	1	1	ditto,
12	81	88	85		29.98	.94	29.97		25	25		15				0	2	0	ditto,
13	81	89	85		.99	.92	.94		10	25		15				0	1	1	ditto,
14	80	89	84	N. M.	.93	.89	.92			30		15				1	1	0	ditto,
15	80	87	82	696	.92	.92	.91		10	40		20				0	1	0	ditto,
16	79	89	83		.91	.93	.93		10	35		30			SW	0	1	0	ditto,
17	78	88	83		.94	30.	.94		0	35		30			SW	0	1	0	ditto,
18	80	87	83		.94	29.97	.96		0	35		30			W	0	1	0	ditto,
19	80	89	83		30.02	.98	30.01		0	40		25			NW	0	1	0	ditto,
20	77	88	82		.04	.98	29.98	10		45		30				0	1	0	ditto,
21	78	88	82		29.98	.96	.99	20		50		45				0	1	0	ditto,
22	78	87	83	F. Q.	30.	.99	.98	30		50		40				0	1	0	Cloudy,
23	77	80	76	702	29.95	.94	.93	10		0			30	0.05		1	2	1	ditto,
24	75	77	76		.88	.89	.92		40		25		25		N	3	3	0	ditto,
25	74	84	79		.92	.88	.93		35	5			5		NW	1	1	0	ditto,
26	76	83	80		.93	.90	.92		20	15		10				1	1	0	ditto,
27	76	86	80		.92	.89	.94		5	30		20				1	1	1	ditto,
28	75	86	80	F. M.	.94	.94	.99		0	40		35				1	1	0	Clear,
29	76	83	80	705	.99	30.	.99	10		35		30				0	1	0	ditto,
30	75	85	80		.98	29.95	30.	10		40		40				0	2	0	ditto,
31	75	85	80		30.	30.	30.02	20		45		40				0	1	0	ditto,
mean	79	86½	82½		29 29	29.91	29.92	5	7	30	1	22	2	0.8	WNW	⅓	1½	⅓	Clear,

A GENERAL STATE *of the* WEATHER, *for* NOVEMBER 1784.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude	78°	86	80	76 Mean temperature,
	Leaſt ditto,	66	76	71	
	Mean ditto,	71	80⅔	75½	
BAROMETER,	Greateſt ditto, in.	30.12	30.05	30.08	30.00 mean ſtate of the atmoſphere,
	Leaſt ditto,	29.60	29.88	29.92	
	Mean ditto,	30.00	29.99	30.02	
	Greateſt variation,	00.52	00 17	00.16	
	Mean denſity,	.712	.696	.706	702 denſity.
HYGROMETER,	Greateſt moiſture,	40	15	15	
	Ditto drought,	45	55	50	
	Mean moiſture and drought,	8m 10d	½m 35d	1m 28d	

* Clear, 23 days.
Cloudy, 7 ditto.
Rain, 1 ditto.
Quantity of ditto, 0·9 inches.

THE N W winds prevailed this month, but nothing remarkable in the changes of the atmoſphere, although there were ſeveral appearances of rain in the courſe of it. The air more elaſtic than any of the former months, alſo more ſerene and dry. The foggy mornings ſtill keep off.

In clear dry weather, there is always a very ſenſible change on the Barometer, two or three hours after ſun riſing; it being often near one-tenth of an inch higher about nine o'clock, than at ſix or ſun riſe. May not this be owing to the load of vapour condenſed and kept near the ſurface of the earth from the coldneſs of the night, which as it is gradually rarefied by the heat of the ſun, muſt increaſe the weight and ſpring of the atmoſphere, and produce this variation? From hence, the Barometer is always higher in the evening before theſe watery particles fall, than in the morning when the air is replete.

CALCUTTA, NOVEMBER 1784.

Day.	*Thermometer.* M.	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m.	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	74	85	80	MON.	30.02	29.99	30.03	20	1	45		35			NW	0	1	0	Clear,
2	77	85	80		.05	.96	.00	15		40		30				0	1	0	Cloudy,
3	77	86	80		.00	.98	.02	10		40		30				0	1	0	Clear,
4	76	85	80		.02	30.00	.03	0		35		35				0	2	0	Cloudy,
5	78	85	79	L. Q.	.00	29.97	.02	5		40		35				0	1	0	Clear,
6	76	84	80	705	.00	30.00	.02	0		40		35				1	2	0	ditto,
7	76	86	79		.02	.02	.02	20		45		45				0	2	1	ditto,
8	73	82	78		.02	.02	.00	35		50		50				0	1	0	ditto,
9	72	83	76		.02	.02	.06	45		55		50				1	1	0	ditto,
10	72	81	78		.10	.08	.08	30		50		45			N	1	1	0	Cloudy,
11	74	76	76		.12	.05	.07	15		0		35		0.9	NE	0	2	0	ditto,
12	75	79	76	N. M.	.07	.04	.05		40		15		15		N	0	1	0	Clear,
13	71	81	77	707	.05	29.98	.02		40	30			15			0	1	0	ditto,
14	77	79	75		29.60	.89	29.92		10	25		20			NE	1	1	0	ditto,
15	74	80	75		.94	.95	30.00		20	25		15				0	1	0	ditto,
16	73	81	73		30.01	30.05	.07		20	40		15			N	0	1	0	ditto,
17	66	80	72		.07	.03	.06		0	50		35			NE	1	2	1	ditto,
18	67	78	74		.04	.02	.04	15		45		40			NW	0	1	1	ditto,
19	68	78	72		.03	29.99	.04	10		45		40			N	1	1	0	ditto,
20	69	78	75	F. Q.	.03	30.02	.05	15		40		35			NW	0	1	0	ditto,
21	69	79	74	718	.02	29.97	.02	5		40		35				0	1	0	ditto,
22	68	78	73		29.98	.93	29.97	0		40		30				0	0	0	Hazy,
23	69	78	72		.97	.92	.94	0	5	35		15			N	1	1	0	Clear,
24	70	78	73		.90	.88	.95		35	5					NW	1	1	0	Cloudy,
25	68	78	71		.92	.96	30.02		35		5		5			0	2	0	ditto,
26	67	79	73		30.03	30.03	.04		40	20		20				0	1	0	Clear,
27	67	79	73	F. M.	.00	.00	.03	20		35		30				1	1	0	ditto,
28	69	80	75	717	.00	.00	.03	10		35		30				0	1	0	ditto,
29	67	80	73		.02	29.99	.04	15		45		20			N	0	1	1	ditto,
30	67	80	73		.05	30.04	.08	20		50		30			NW	1	2	1	ditto,
mean	71½	80⅔	75½		30.00	29.99	30.02	10	8	35	½	28	1	0.9	NW	⅓	1⅕	⅙	Clear.

A GENERAL STATE *of the* WEATHER, *for* DECEMBER 1784.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude	69	79	73	
	Leaſt ditto,	58	68	65	68⅔ Mean heat,
	Mean ditto,	63½	74	68⅔	
BAROMETER,	Greateſt ditto,	30.17	30.14	30.17	
	Leaſt ditto,	30.02	30.00	30.02	30°.08 Mean ſtate of the atmoſphere.
	Mean ditto,	30 09	30.07	30.09	
	Greateſt variation,	09.15	00.14	09.15	
	Mean denſity,	.727	.709	.721	.717 Mean denſity.
HYGROMETER,	Mean moiſture and drought,	24d.	48d.	38d.	

Clear, 26 days.
Cloudy, 5 ditto.
Rain, 1 ditto.
Quantity of ditto, 0.05 inches.

THE winds were conſtantly NW, except a few days, when it was inclined a little to the E, which always brings on cloudy thick weather. The whole month remarkably dry, and the atmoſphere of ſuch a denſity as greatly to exceed any of the former. At this ſeaſon of the year, there is generally a thick diſagreeable fog in the mornings and evenings; however, this month, on the contrary, has been very clear and ſerene, and but ſeldom thick fogs at either of theſe times.

CALCUTTA, DECEMBER 1784.

Day.	*Thermometer.*			*Mean denſity at each quarter of the Moon.*	*Barometer.*			*Hygrometer.*						*Rain.*	*Wind and Force.*				
	M	*N.*	*E.*		*M.*	*N.*	*E.*	*M.* *d.*	*m.*	*N.* *d.*	*m.*	*E.* *d.*	*m.*		*Point.*	*M.*	*N.*	*E.*	
1	65	79	72		30.07	30.10	30.10	20		45		30		0.05	NE	1	1	1	Cloudy,
2	68	76	72		.07	.04	.07	40		50		30				1	1	0	ditto,
3	69	78	72		.03	.01	.06	20		40		20				0	1	0	ditto,
4	67	78	73	L. Q.	.06	.05	.09	15		30		15			NW	1	2	1	ditto,
5	65	79	72	721	.10	.08	.09	0		45		25				1	2	0	Clear,
6	65	75	70		.08	.05	.10	30		50		45				2	3	0	ditto,
7	63	75	68		.08	.03	.05	45		55		45				1	2	1	ditto,
8	61	74	68		.07	.04	.09	40		55		45				2	1	0	ditto,
9	61	75	69		.07	.06	.07	30		55		45				2	1	0	ditto,
10	62	75	68		.08	.06	.07	30		55		40				1	1	0	ditto,
11	61	75	68		.07	.04	.08	30		55		45				1	1	0	ditto,
12	62	73	68	N. M.	.09	.03	.08	20		40		35				1	0	0	ditto,
13	62	74	69	728	.08	.04	.05	10		40		40				0	1	0	ditto,
14	64	71	69		.05	.01	.04	20		35		25			N	0	0	0	Cloudy,
15	66	73	68		.04	.07	.08	20		40		35			NNE	1	1	0	ditto,
16	64	75	70		.09	.06	.08	30		45		40			NW	0	1	0	Clear,
17	67	75	70		.07	.01	.02	30		40		30				0	1	0	ditto,
18	66	76	72		.02	.00	.07	10		40		25			NE	0	2	0	ditto,
19	67	75	71	F. Q.	.06	.06	.07	0		50		25			W	0	1	0	ditto,
20	66	75	66	725	.06	.05	.08	25		55		40			NW	0	1	0	ditto,
21	65	74	67		.11	.10	.13	35		60		50				0	1	0	ditto,
22	61	71	65		.17	.13	.17	45		50		50				0	2	0	ditto,
23	58	71	65		.17	.12	.14	35		45		40				1	1	0	ditto,
24	60	72	66		.14	.13	.14	10		50		40				1	1	0	ditto,
25	60	72	68		.15	.14	.16	15		45		45				0	1	0	ditto,
26	61	73	68	F. M.	.17	.14	.14	5		45		35				1	2	0	ditto,
27	61	73	68	732	.15	.13	.14	15		50		40				1	2	0	ditto,
28	60	72	67		.14	.10	.13	20		55		40				1	1	0	ditto,
29	60	70	65		.10	.10	.10	30		55		45			W	0	1	0	ditto,
30	60	69	65		.10	.06	.07	40		55		45			NW	0	1	0	ditto,
31	60	68	65		.08	.05	.06	40		55		45				0	1	0	ditto,
mean	63½	74	68½		30.09	30.07	30.09	24		48		38		0.05		⅔	1½	7/16	

A GENERAL STATE *of the* WEATHER, *for* JANUARY 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude,	70	78	74	
	Leaſt ditto,	57	69	64	66 Mean heat.
	Mean ditto,	61	72	66⅔	
BAROMETER,	Greateſt ditto,	30.17	30.14	30.17	
	Leaſt ditto,	29.98	29.97	30.03	Mean ſtate of the atmoſphere. — 30.08
	Mean ditto,	30.08	30.07	30.09	
	Greateſt variation,	00.19	00.17	00.14	
	Mean denſity,	.732	.712	.723	722 Mean denſity.
HYGROMETER,	Moiſture and drought,	30 d.	50 d.	40 d.	

Clear, 29 days,
Cloudy, 2 ditto,

THE atmoſphere very dry and elaſtic.

THE winds variable, but from the middle of the month were almoſt conſtantly from the SW and S, and often pretty ſtrong.

THE mercury in the Barometer ſtood very high till about the end of the month, when a very ſenſible change took place, both with regard to the warmth and ſerenity of the weather; frequent heavy dews about the ſame time.

THE mornings always very foggy.

THE medium heat of the ſun at mid-day (the inſtrument being expoſed five minutes) was 90°

CALCUTTA, JANUARY 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	60	69	64		30.09	30.09	30.09	30		50		45			WN	0	1	0	Clear,
2	57	69	64		.09	.09	.11	40		50		45			NW	0	1	0	ditto,
3	60	71	65		.11	.06	.07	25		45		40				0	1	0	ditto,
4	59	69	65	L. Q.	.04	.04	.09	30		50		40			WNW	0	1	0	ditto,
5	63	70	66	732	.10	.08	.08	35		50		40				0	2	0	ditto,
6	64	70	66		.07	.08	.12	30		50		40			W	0	2	0	ditto,
7	63	72	67		.13	.13	.17	35		55		50			NW	0	2	0	ditto,
8	59	72	67		.14	.13	.10	35		60		50			N	1	2	0	ditto,
9	58	73	65		.10	.09	.09	35		60		45			NW	1	2	0	ditto,
10	60	70	65		.10	.10	.14	40		60		50				0	1	0	ditto,
11	58	72	65	N. M.	.13	.10	.12	35		60		50				1	2	1	ditto,
12	59	72	65	736	.11	.11	.11	25		50		45			N	1	2	0	ditto,
13	60	72	66		.11	.11	.12	30		50		45			NW	2	1	0	ditto,
14	60	73	67		.12	.11	.13	40		45		45				0	1	0	ditto,
15	58	71	65		.14	.14	.14	35		50		50				1	2	0	ditto,
16	60	70	65		.15	.15	.17	40		55		50				0	2	0	ditto,
17	60	69	65	F. Q.	.17	.13	.10	45		55		50			N	1	1	0	ditto,
18	59	70	65	736	.10	.10	.06	40		55		50			NW	1	2	0	ditto,
19	60	70	65		.08	.05	.05	40		60		50				0	2	0	ditto,
20	58	71	65		.05	.05	.05	30		55		50				0	1	0	ditto,
21	64	74	67		.02	.00	.07	0		40		30			SW	0	1	0	ditto,
22	60	71	65		.08	.05	.08	40		55		50			W	1	2	0	ditto,
23	59	70	65		.04	.04	.05	40		60		55			SW	1	2	0	ditto,
24	62	70	66	F. M	.06	.04	.05	40		55		50			W	0	2	0	ditto,
25	62	75	68	728	.08	.06	.07	40		55		45				0	1	0	ditto,
26	63	74	69		.07	.01	.03	30		45		30			SW	0	2	0	ditto,
27	68	74	70		29.98	29.97	.03		15	40		30			S	0	2	0	ditto,
28	67	76	69		30.01	.98	.04	10		55			10		SW	1	2	0	ditto,
29	65	77	74		.02	30.01	.05	40		60		50			S	0	3	0	ditto,
30	66	76	71		.00	.01	.03	10		40			10			0	3	1	Cloudy,
31	70	78	74		.02	.03	.05		40	0			10			0	3	2	ditto,
mean	61⅓	74	66⅔		30.08	30.07	30.09	30	1¾	50		40	1		var.	½	2	⅛	Clear.

A GENERAL STATE of the WEATHER, for FEBRUARY 1785.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude,	74	86	76	
	Leaſt ditto,	68	75	69	75 Mean temperature.
	Mean ditto,	71	79½	74	
BAROMETER,	Greateſt ditto,	30.14	30.17	30.15	
	Leaſt ditto,	29.89	29.89	29.96	30.02 Mean ſtate of the
	Mean ditto,	30.02	30.01	30.04	atmoſphere.
	Greateſt variation,	0.25	0.28	0.19	
	Mean denſity,	.713	.698	.708	.706
HYGROMETER;	Moiſture and drought,	0	28 d.	22 d.	

Clear - - - 17 days.
Cloudy, - - 11 ditto.
Rain, - - - 4 ditto.
Quantity ditto, 2-9 inches.

THUNDER five times. Mean heat of the Sun at mid-day, the Thermometer being expoſed five minutes, 96°.

THE beginning of this month the air was very moiſt, which is generally the caſe when the wind comes from the S and SE. ON the contrary, the NW winds which prevailed, renders it very dry and elaſtic, and has always a very great effect in raiſing the mercury in the Barometer. During the whole of this month the mornings were extremely thick and foggy; on the 11ſt, 8th, and 12th, moderate ſtorms from the NW.

CALCUTTA, FEBRUARY 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	71	77	74		30.00	29.90	29.95		50	0	0		40	0.5	S	1	4	1	Cloudy,
2	73	76	71		29.89	.89	.96		40		15		20		SE	1	2	1	ditto,
3	69	77	73	L. Q.	.96	.96	30.03		30	25		20				0	1	0	Clear,
4	72	78	74	714	33.08	30.07	.12		30		5		30		S	0	1	0	Cloudy,
5	72	79	75		.08	.04	.04		4	15			25			0	1	P	Clear,
6	74	80	76		29.98	.03	.05		50	30			20			3	2	1	Cloudy,
7	72	80	72		.98	29.99	.04		45	35		0	0		SE	1	P	1	Clear,
8	75	80	73		30.05	30.04	.11		30		15		5	0.8	E	0	1	0	ditto,
9	68	78	74	N. M.	.07	.03	.03		35		15		5		W	1	1	0	Cloudy,
10	72	80	75	711	29.97	29.95	29.98		35	40		30			N	2	1	0	Clear,
11	70	80	74		.98	.99	30.03	10		60		55				1	1	0	ditto,
12	73	82	69		30.03	30.03	.12	30		30		40		1.1	NW	0	0	3	Cloudy,
13	69	79	72		.05	.00	.06	25		45		40				1	0	2	ditto,
14	69	81	74		.01	.00	.04	35		55		50			SW	1	1	0	Clear,
15	70	81	75		.04	.01	.04	30		45		45				0	1	0	ditto,
16	70	75	73	F. Q.	.07	.06	.08	35		55		50			NW	3	3	0	Cloudy,
17	69	80	73	717	.06	.02	.05	40		60		55			SW	0	1	1	Clear,
18	70	73	69		.02	.02	.04	35		30			5	0.7		0	2	1	Cloudy,
19	67	75	71		.03	.04	.03		15			15				0	2	1	ditto,
20	69	79	72		.03	.03	.03		10	25		20			NW	0	2	0	Clear,
21	69	77	73		.04	.04	.04	0		20		25			W	0	2	1	ditto,
22	70	82	75		29.98	29.97	29.97		10			15				0	1	1	ditto,
23	74	84	76		.99	.96	30.00		20	35		45				1	2	1	ditto,
24	72	82	75	F. M.	30.00	.98	29.98	35		55		45				0	1	0	ditto,
25	72	86	76	710	29.96	.96	.97	30		60		55			NW	0	1	0	Cloudy,
26	73	81	76		.96	.96	30.00	50		60		55			NW	1	1	0	Clear,
27	73	83	74		30.03	30.03	.10	50		60		55				0	1	0	ditto,
28	70	81	73		.14	.17	.15	50		60		55				0	1	0	ditto,
mean	71	79½	74		30.02	30.01	30.04	15	15	30	2	28	6	2.9		½	1⅓	½	

A GENERAL STATE *of the* WEATHER, *for* MARCH 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude,	80°	90°	83°	79°
	Leaſt ditto,	68	80	73	
	Mean ditto,	75	85	78	
BAROMETER,	Greateſt ditto,	30.12	30.10	30.13	29.95
	Leaſt ditto,	29.85	29.84	29.86	
	Mean ditto,	29.95	29.92	29.97	
	Greateſt variation,	.27	.26	.27	
	Mean denſity,	.675	.688	.700	.698
HYGROMETER,	Moiſture and drought,	0 .0	36 d.	18 d.	

Clear, 20 days.
Cloudy, 11 ditto.
Rain, 3 ditto.
Quantity ditto, 0·5 inches.

THUNDER five times. Mean heat of the ſun 100°.

THERE were two or three thunder ſtorms this month, but gentle, and attended with very little rain. Several mornings about the beginning, were very foggy and damp, and continued ſo, but in a leſſer degree, nearly throughout the month. Heavy dews from the 15th.

THE Barometer continued low, which may proceed from the high winds that prevailed, as well as from the extreme rarefaction of the atmoſphere at this ſeaſon of the year. We had often the appearance of rain, as muſt always be the caſe while the wind comes from the South quarter, and bringing with it ſo much vapour.

CALCUTTA, MARCH 1785.

Day.	*Thermometer.* M.	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m.	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	68	84	73		30.12	30.10	30.13	55		60		60			NW	1	2	0	Clear,
2	68	84	73		.10	.07	.08	50		60		55				0	1	0	ditto,
3	69	80	74		.05	.04	.07	50		55		50			SW	0	2	1	ditto,
4	72	82	75	L. Q.	.04	.03	.06	25		50		50				1	2	2	ditto,
5	73	83	75	.713	.05	.04	.04		5	35		25			SE	0	3	1	ditto,
6	73	81	76		.03	29.98	.00		5	50		35				0	4	1	ditto,
7	73	82	77		29.97	.99	.04		0	55		40			S	0	4	1	ditto,
8	73	82	77		30.02	30.03	.07	20		45		40			SE	0	3	2	Cloudy,
9	73	87	77		.06	.04	.07	40		55		40			SW	1	2	0	Clear,
10	74	84	74		.05	.02	.05	25		50		45		0.1	SW	0	3	1	Cloudy,
11	71	83	76	N. M.	.02	29.98	.02	45		50		40			SE	0	2	1	Clear,
12	74	85	77	.709	29.98	.90	29.93	10		40		15				0	2	1	Cloudy,
13	75	84	75		.90	.84	.89			20		40		0.3		1	3	2	Clear,
14	71	84	74		.90	.88	.93	35		30		15		ſome hail.		0	3	1	Cloudy,
15	75	84	74		.90	.85	.93			40		20				1	4	3	ditto,
16	73	83	77		.87	.87	.97	10	20	20		20				3	4	4	ditto,
17	77	85	80		.90	.89	.97		10	25		0			S	1	1	1	ditto,
18	77	86	80	F. Q.	.96	.88	.93		20	21		0		10	SW	0	2	1	Clear,
19	77	89	82	.702	.92	.87	.92		25	50					SE	1	2	1	ditto,
20	78	90	83		.89	.85	.88		35	40		10			SW	0	2	2	ditto,
21	78	87	81		.86	.84	.87		20	20		10		10	SE	1	3	1	Cloudy,
22	79	86	81		.87	.87	.89		30	10				10	S	1	4	2	ditto,
23	79	85	81		.85	.84	.89		30	10						1	3	4	Clear,
24	77	85	80		.87	.85	.89		10	20				0.1		1	2	3	ditto,
25	78	87	81		.89	.92	.98		30	35						0	3	2	ditto,
26	79	86	81	F. M.	.96	.91	.91		30	20				10		0	3	3	Cloudy,
27	78	88	82	.696	.89	.93	.86		20	20						2	3	1	Clear,
28	79	88	82		.85	.87	.92		35	15				5		1	2	3	ditto,
29	79	88	83		.90	.87	.92		25	20				5		1	2	2	ditto,
30	80	84	82		.95	.87	.90		30	20				20		0	0	0	Cloudy,
31	79	88	82		.90	.85	.90	25		60		40				0	1	0	Clear,
mean	75	85	78		29.95	29.92	29.97	13	13	36		20	2	0.5	S	½	3	2	Clear.

A GENERAL STATE *of the* WEATHER, *for* APRIL 1785.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude,	83	91	85	82½
	Leaſt ditto,	69	75	74	
	Mean ditto,	79	86½	82	
BAROMETER,	Greateſt ditto,	29.97	29.92	29.97	69.83
	Leaſt ditto,	29.70	29.68	29.74	
	Mean ditto,	29.83	29.81	29.86	
	Greateſt variation,	.27	.24	.23	
	Mean denſity,	.695	.684	.691	.690
HYGROMETER,	Moiſture and drought,	20 m.	20 d.	4 d.	

Clear - - - 17 days.
Cloudy, - - 13 ditto.
Rain, - - - 6 ditto.
Quantity ditto, 8 inches.

THE quantity of rain that fell on the 16th and 17th was very conſiderable, and the variation that appeared on the mercury before and after the thunder ſtorms was very great, ſometimes 00.30 in the ſpace of a few minutes.

THUNDER ſix times. Mean heat of the ſun 108° to 112°.

THE temperature of the air throughout this month was leſs warm and ſultry than it is generally found at this time of the year, as alſo the ſtorms that came from the NW were fewer in number. The air rather moiſt, and little or no variation in the winds, they being always directly S and SE.

CALCUTTA, APRIL 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	79	84	80		29.90	29.86	29.90	30		55		50			S	0	2	2	Clear,
2	75	90	80		.89	.82	.85	25		60		30				0	1	2	ditto,
3	77	90	83	L. Q.	.82	.77	.81		20	60		30				1	3	2	ditto,
4	77	90	82	.697	.82	.80	.84		10	45		20				0	1	3	ditto,
5	79	88	83		.83	.80	.83			45		30				0	3	1	ditto,
6	79	90	83		.81	.82	.83			35		25				0	3	3	ditto,
7	78	88	82		.86	.85	.88			20		20				1	4	3	ditto,
8	80	88	81		.88	.83	.84		15	30						0	4	4	Cloudy,
9	80	87	84	N. M.	.82	.81	.84		30	20		10				2	3	2	Clear,
10	80	87	84	.694	.78	.77	.85		30	40			10			1	4	1	Cloudy,
11	81	88	85		.83	.82	.86		25	50		15				1	2	3	ditto,
12	81	88	85		.82	.80	.87		30		10	35				1	0	1	ditto,
13	81	85	84		.82	.86	.89		25	30		35				1	0	0	ditto,
14	83	84	82		.87	.87	.89		10	40		40				1	4	0	ditto,
15	81	84	83		.90	.92	.97	20		30					NW	1	0	1	ditto,
16	78	81	74	F. Q.	.97	.92	.96	45			40		0	2.4		3	2	4	ditto,
17	69	75	75	.698	.86	.79	.83		30		20		50	3.6	NE	3	3	2	ditto,
18	77	82	80		.82	.88	.94		60	15			20	0.5	S	0	0	0	Clear,
19	79	84	82		.92	.84	.90		40							0	4	0	Cloudy,
20	78	85	81		.85	.79	.93		20							1	2	2	Clear,
21	75	84	80		.85	.83	.90		10							1	3	2	Cloudy,
22	74	82	80		.85	.84	.87		20		10		10	0.9		1	2	0	Clear,
23	79	85	83		.83	.80	.83		40		10		20		SE	1	2	1	Cloudy,
24	81	88	85	F. M.	.80	.75	.78		40	10			20			1	3	1	Clear,
25	82	89	85	.694	.77	.76	.84		40	20			10			1	2	1	ditto,
26	83	89	81		.76	.77	.87		30		10		10	0.3	S	1	4	4	Cloudy,
27	82	89	82		.72	.68	.83		40		20		20	0.3		3	4	4	ditto,
28	79	87	83		.70	.75	.74		40	20			30			1	3	3	ditto,
29	82	90	85		.76	.79	.84		50	10			15			0	3	1	ditto,
30	82	91	85		.82	.83	.84		40	10			15			1	3	1	ditto,
mean	79	86½	82		29.83	29.81	29.86	4	24	24	4	12	8	8.0	S	1	3	2	Cloudy.

A GENERAL STATE of the WEATHER, for MAY 1785.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude,	87	94	89	86
	Leaſt ditto,	79	87	80	
	Mean ditto,	83	89⅔	85	
BAROMETER,	Greateſt ditto,	29.96	89.92	30.03	29.77
	Leaſt ditto,	29.60	29.53	29.63	
	Mean ditto,	29.77	29.74	29.82	
	Greateſt variation,	.36	.39	.30	
HYGROMETER,	Mean moiſture,	1 m.	30 d.	20 d.	.682
	Mean denſity,	.685	.676	.685	

Clear, - - - 16 days
Cloudy, - - - 13 ditto.
Rain, - - - 10 times.
Quantity ditto, - 6 inches.

THUNDER fourteen times. Mean heat of the ſun 110° to 111°.

THE air this month has been drier than that of the preceding, but the winds being more from the SE quarter is the reaſon of the mercury being ſo low; much cloſe and ſultry weather about the middle. The variation on the Barometer much greater than uſual.

CALCUTTA, MAY 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	82	92	86		29.82	29,80	29.81			40	10		10		S	1	2	1	Clear,
2	83	91	85		.77	.74	.75			30	10		10			2	2	2	ditto,
3	83	91	87	L. Q.	.75	.68	.75			30	20	20				1	1	2	ditto,
4	87	91	86	.688	.76	.78	.83	15			40	20				6	3	1	ditto,
5	85	89	86		.78	.83	.87	0			30	20				1	4	4	Cloudy,
6	83	90	83		.96	.86	30.03	15			30	20		0.5		2	3	2	Clear,
7	81	87	84		.78	.78	29.94	10			35	30			E	1	2	1	Cloudy,
8	82	90	87		.95	.92	.97			10	50	30			S	0	2	0	Clear,
9	83	90	85	N. M.	.94	.89	.95			10	50	25				0	2	1	ditto,
10	83	89	85	.690	.92	.85	.89	10			45	20		0.3	SE	0	2	0	ditto,
11	84	90	83		.86	.79	.83	10			50	30				0	2	2	ditto,
12	83	90	83		.80	.77	.85				50	15		0.1		1	2	2	ditto,
13	84	89	85		.80	.78	.83			10	45	35				3	3	0	ditto,
14	84	91	85		.83	.77	.82	25			50	30				0	1	0	Cloudy,
15	84	92	86		.84	.77	.80			10	60	55				0	1	0	Clear,
16	86	93	84		.81	.76	.86	40			60	55			SW	0	0	0	ditto,
17	82	92	85	F. Q.	.83	.81	.90	20			56	30				0	1	0	Cloudy,
18	80	88	84	.688	.77	.86	.93			10	40	20		1.4	S	0	1	0	ditto,
19	81	88	86		.89	.81	.83	10			50	40			SW	1	0	0	Clear,
20	83	89	86		.80	.72	.79	10			50	40			S	0	0	0	Cloudy,
21	84	91	83		.75	.67	.79	10			55	40				0	1	1	Clear,
22	82	90	87		.74	.65	.75	30			40	40				0	1	0	Cloudy,
23	83	91	89		.69	.58	.66	10			40	35			SE	0	1	0	Clear,
24	87	94	89	F. M.	.63	.53	.66	20			20	20		0.2	S	0	0	4	Cloudy,
25	84	92	82	.685	.60	.59	.63			10	60	10		1.3		1	0	0	ditto,
26	79	88	85		.65	.64	.70			10	50	20			SE	1	0	0	ditto,
27	84	90	80		.65	.64	.76			20	40		10	0.5		0	3	1	ditto,
28	82	88	85		.70	.70	.78			20	40		10			0	1	3	Clear,
29	81	88	82		.73	.70	.75	10			40	10		0.4	S	3	3	1	Cloudy,
30	84	90	85		.74	.66	.72		20	0				0.1		3	3	2	Clear,
31	83	87	85		.61	.68	.72		40		20		40	1.2	SW	2	1	1	Cloudy,
mean	83	89⅔	85		29.77	29.74	29.82	8	9	40	1	23	3	6.0		4	2	1	Clear.

A GENERAL STATE *of the* WEATHER, *for* JUNE 1785.

		M.	*N*	*E.*	
THERMOMETER,	Greateſt altitude,	84	90	85	
	Leaſt ditto,	79	80	79	82⅔
	Mean ditto,	81½	84½	82	
BAROMETER,	Greateſt ditto,	29.70	29.68	29.72	
	Leaſt ditto,	29.44	29.40	29.47	29.58
	Mean ditto,	29.59	29.56	29.61	
	Greateſt variation,	.26	.28	.25	
	Mean denſity,	.687	.681	.685	.684
HYGROMETER,	Moiſture and drought,	50 m.	30 m.	40 m	

Clear, 4 days.
Cloudy, 26 ditto.
Rain, 24 times.
Thunder, 16 ditto.
Quantity of rain, 24 inches.

MEAN heat of the Sun 106°.

THE quantity of rain this month has been uncommonly great, and ſcarce a day paſſed without ſome falling; the weather of courſe diſagreeable and unhealthy.

THE mercury in the Barometer very low, which ſeldom fails to be the caſe, while the winds come from the SE and E quarters.

CALCUTTA, JUNE 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	m.	N. d.	m	E. d.	m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	84	90	83		29.61	29.54	29 65		40		10		20	0.2	S	0	0	1	Cloudy,
2	83	85	82		.63	.61	.68		40		20		40		SE	1	1	0	ditto,
3	81	90	83		.68	.67	.70		45		0		20			0	1	1	Clear,
4	81	85	82		.70	.66	.72		40		40		50	0.7		1	0	0	Cloudy,
5	81	86	83		.70	.62	.64		40		30		40		NE	1	0	1	ditto,
6	81	85	83		.62	.55	.61		60		30		40	0.1	E	1	1	1	ditto,
7	82	85	82	N. M.	.59	.61	.69		50		50		50	0.1		1	1	0	ditto,
8	82	84	80	.687	.64	.60	.68		60		60		60	0.5	SE	1	0	0	ditto,
9	80	80	82		.68	.65	.70		60		60		60	2.7		0	1	1	ditto,
10	80	84	84		.57	.64	.68		60		40		60	1.5	S	0	1	0	Clear,
11	82	84	84		.67	.64	.70		60		20		50	0.1		0	0	1	Cloudy,
12	82	87	84		.70	.68	.70		50		10		30			0	1	0	Clear,
13	84	87	85		.62	.68	.58		30		30		30			0	1	0	ditto,
14	83	87	81		.56	.46	.50		50		30		30	0.2		0	1	0	Cloudy,
15	84	84	82	F Q.	.44	.40	.47		50		50		40	2.9	SE	0	0	2	ditto,
16	81	84	80	.681	.48	.49	.57		60		50		50	1.7		0	1	0	ditto,
17	82	83	80		.54	.58	.65		60		60		50	1.4	E	0	1	0	ditto,
18	79	82	79		.63	.62	.66		60		60		60	2.9	SE	0	1	0	ditto,
19	80	82	80		.58	.56	.60		60		40		60	1.3		1	2	1	ditto,
20	80	82	81		.57	.54	.62		60		40		50	0.2		2	1	1	ditto,
21	79	83	82		.57	.54	.60		50		40		40	0.3		0	1	0	ditto,
22	81	84	82	F. M	.57	.55	.57		40		40		50	N		0	1	1	ditto,
23	81	82	80	.687	.55	.55	.59		50		30		60	5.9		0	0	0	ditto,
24	80	84	82		.56	.52	.58		50		30		40	0.1		1	1	0	ditto,
25	82	85	83		.53	.52	.57		50		30		40	N		1	1	2	ditto,
26	82	85	83		.52	.52	.55		50		30		40	0.1		1	0	0	ditto,
27	83	85	84		.47	.48	.54		50		30		40	0.1		0	0	1	ditto,
28	82	84	83	L. Q.	.35	.45	.50		50		30		40	0.6		1	0	0	ditto,
29	8	85	84	.681	.48	.44	.48		50		30		40			0	2	0	ditto,
30	82	85	84		.46	.45	.49		50		30		40	0.8	NE	0	1	0	ditto,
mean	81	84½	82		29.59	29.56	29.61		50		30		40	24.4		½	¾	½	Cloudy.

A GENERAL STATE *of the* WEATHER, *for* JULY 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude	84°	89	87	82⅔
	Leaſt ditto,	79	80	80	
	Mean ditto,	81⅓	84⅓	82⅓	
BAROMETER,	Greateſt ditto,	29.73	29.67	29.73	29.59
	Leaſt ditto,	29.44	29.45	29.47	
	Mean ditto,	29.59	29.56	29.62	
	Greateſt variation,	.29	.22	.26	
	Mean denſity,	.686	.681	.989	.684
HYGROMETER,	Mean moiſture,	50 m.	35 m.	45 m.	

Clear, 4 days.
Cloudy, 27 ditto.
Rain, 24 times.
Quantity of ditto, 12-8 inches.
Thunder, 11 times.

MEAN heat of expoſed air 100°.

THE weather this, as the preceding month, very relaxing and diſagreeable, although the quantity of rain only about one half. The low ſtate of the mercury is undoubtedly affected by the Eaſterly winds, as is no leſs the animal ſpirits.

CALCUTTA, JULY 1785.

Day.	*Thermometer.* M.	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m.	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	82	86	85		29.47	29.46	29.52	40		20		40		0.1	SE	0	0	0	Cloudy,
2	80	80	83		.51	.50	.58	40		30		40		0.3	NE	1	1	2	ditto,
3	79	83	81		.52	.53	.57	50		30		50		0.2		1	0	3	ditto,
4	80	84	81		.56	.54	.60	60		40		0		2.6	S	0	1	0	ditto,
5	82	82	81		.58	.54	.59	60		50		60		0.3	S	0	0	0	ditto,
6	81	80	80	N. M.	.54	.45	.47	60		60		60		2.6	SE	0	0	3	ditto,
7	79	83	81	684	.44	.47	.57	60		60		60		0.1	SW	0	2	2	ditto,
8	80	82	80		.54	.57	.63	60		60		60		0.4	SE	0	1	1	ditto,
9	80	84	81		.60	.59	.66	60		60		60			S	1	1	1	ditto,
10	80	85	83		.66	.63	.70	60		20		40				0	1	1	ditto,
11	82	84	82		.68	.66	.70	60		30		40		R		0	0	1	ditto,
12	81	85	83		.66	.57	.58	50		30		40		1.3	SE	0	1	2	ditto,
13	83	83	82		.55	.48	.54	50		40		50		1.7		0	1	0	ditto,
14	81	83	81	F. Q.	.52	.51	.62	50		40		50		0.1	SE	1	1	3	ditto,
15	80	84	83	686	.63	.63	.68	50		20		30			SW	2	2	2	ditto,
16	82	85	83		.67	.60	.64	50		30		40		0.3	S	2	1	2	ditto,
17	82	86	84		.62	.57	.57	50		20		30		0.2	S	1	1	4	Clear,
18	82	83	81		.52	.49	.50	50		30		40		0.5	SW	1	2	3	Cloudy,
19	80	84	80		.47	.50	.57	50		20		40		0.6	SE	1	1	0	ditto,
20	80	83	82		.55	.54	.60	50		30		40		0.6	SW	0	0	1	ditto,
21	81	84	82		.57	.55	.63	50		30		40			S	0	1	1	ditto,
22	81	83	81	F. M.	.60	.62	.66	50		40		40		0.1	SE	0	0	0	ditto,
23	80	84	81	687	.66	.64	.72	50		40		30		0.1		1	1	0	ditto,
24	80	85	83		.72	.67	.73	50		40		20		R		1	2	0	ditto,
25	83	87	85		.73	.67	.69	25		30		10			S	1	1	0	Clear,
26	84	87	84		.72	.67	.72	30		30		10		0.1	SE	0	0	1	ditto,
27	84	86	84		.70	.63	.67	10		10		20			S	0	0	0	Cloudy,
28	84	85	84	L. Q.	.67	.60	.64	30		0		0		0.3	SE	0	2	1	ditto,
29	84	89	87	688	.64	.58	.66	40		0		20				0	1	0	Clear,
30	84	87	85		.60	.56	.60	40		20		20		0.1		0	1	0	Cloudy,
31	82	86	84		.57	.46	.65	40		10		20		0.1		1	0	1	ditto,
mean	81⅓	84⅓	82⅓		29.59	29.56	29.62	50		35		45		12.8		½	1	1	Cloudy.

A GENERAL STATE of the WEATHER, for AUGUST 1785.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude,	84	89	86	$82\frac{2}{3}$
	Leaſt ditto,	79	80	80	
	Mean ditto,	$81\frac{1}{2}$	$84\frac{1}{3}$	$82\frac{1}{2}$	
BAROMETER,	Greateſt ditto,	29.78	29.72	29.78	29.62
	Leaſt ditto,	29.50	29.49	29.57	
	Mean ditto,	29.62	29.59	29.64	
	Greateſt variation,	.28	.23	.21	
	Mean denſity,	.687	.682	.686	.685
HYGROMETER,	Moiſture,	50 m	30 m	40 m	

Clear,	3	days.
Cloudy,	28	ditto.
Thunder,	16	times.
Rain,	20	ditto.
Quantity ditto,	9·3	inches.

THE heat of the ſun at mid-day 100°.

MUCH cloudy weather, but ſeldom any very heavy falls of rain, and the quantity altogether but moderate. The river very full, and accounts of heavy rains up the country.

THE Barometer remarkably low the whole month; a proof of there being ſtill much water in the Clouds.

CALCUTTA, AUGUST 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	m.	N. d.	m.	E. d.	m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	80	84	82		22.53	29.50	29.58	50		40		40		0.3	SE	0	1	1	Cloudy,
2	81	86	83		.56	.53	.60	50		30		20				0	1	0	Clear,
3	83	84	83		.59	.56	.63	50		20		30				0	1	0	Cloudy,
4	83	87	85	N. M.	.60	.55	.60	40		20		20		0.1		1	1	0	ditto,
5	81	83	81	685	.59	.58	.61	40		40		40		1.3		1	1	0	ditto,
6	80	83	81		.56	.54	.60	50		40		50		0.9		1	1	1	ditto,
7	81	84	81		.58	.56	.65	60		40		50		0.2		0	1	0	ditto,
8	80	82	81		.63	.62	.74	60		50		50		1.2		0	1	1	ditto,
9	70	80	80		.74	.74	.76	60		60		50		0.1		0	0	1	ditto,
10	79	84	82		.74	.68	.70	60		50		50				0	1	1	ditto,
11	82	87	85		.65	.59	.62	60		30		50				0	0	1	Clear,
12	82	85	83	F. Q.	.60	.61	.64	50		30		40				0	1	1	Cloudy,
13	81	83	82	686	.63	.60	.64	50		40		30				0	0	0	ditto,
14	81	85	84		.58	.50	.57	50		30		40		0.3		0	1	1	ditto,
15	83	86	84		.53	.49	.57	50		40		30		0.4		0	1	0	ditto,
16	82	83	82		.54	.53	.57	50		30		20		0.5	NE	1	1	2	ditto,
17	82	84	82		.50	.54	.62	50		20		30		0.2	SE	1	1	1	ditto,
18	83	84	83		.62	.58	.64	50		30		40		1.3		1	1	1	ditto,
19	84	87	85		.60	.58	.63	50		20		30				0	1	2	ditto,
20	80	89	86	F. M.	.58	.60	.66	40		0		0			NE	0	1	1	Clear,
21	84	85	85	687	.62	.60	.67	20		20		20			SE	0	1	0	Cloudy,
22	83	87	84		.62	.57	.64	30		10		20		0.2		4	1	1	ditto,
23	83	85	83		.61	.60	.60	40		30		30		0.1		1	1	1	ditto,
24	81	85	82		.63	.63	.70	40		30		30		0.3	NE	1	1	1	ditto,
25	82	85	84		.68	.67	.72	40		30		40				1	1	0	ditto,
26	81	84	81		.70	.66	.71	40		30		40		0.3		0	0	2	ditto,
27	80	84	81	L. Q.	.73	.70	.78	40		30		30		0.1		0	0	1	ditto,
28	81	85	83	690	.78	.72	.78	40		20		30		0.1		0	0	1	ditto,
29	81	85	83		.74	.67	.76	50		20		30			SE	0	0	1	ditto,
30	82	84	83		.70	.67	.73	40		20		30		0.1		0	0	0	ditto,
31	82	83	82		.67	.62	.69	30		30		30		1.4		1	1	1	ditto,
mean	$81\frac{1}{2}$	$84\frac{1}{2}$	$82\frac{1}{2}$		29.62	29.59	29.64	50		30		40		9.3	SE	$\frac{1}{2}$	1	1	Cloudy,

A GENERAL STATE of the WEATHER, for SEPTEMBER 1785.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude,	84°	89°	85	82⅔
	Leaſt ditto,	80	81	80	
	Mean ditto,	81	85	82½	
BAROMETER,	Greateſt ditto,	29.83	29.82	29.87	29.71
	Leaſt ditto,	29.62	29.59	29.66	
	Mean ditto,	29.71	29.68	29.75	
	Greateſt variation,	.21	.23	.21	
HYGROMETER,	Moiſture,	45 m	20 m.	25 m	.686
	Denſity,	.687	.682	.688	

Clear, 8 days.
Cloudy, 22 ditto.
Rain, 16 times.
Thunder, 13 ditto.
Quantity of rain, 11-7 inches.

MEAN heat of the ſun at mid-day 110°.

THE Barometer higher than the former month; about the middle and end, great quantities of rain. By accounts from Berhampore, the quantity of rain there muſt have been very conſiderable, and many parts above, the whole country being under water, and the river ſwelling prodigiouſly. This month very unhealthy and many people dying.

CALCUTTA, SEPTEMBER 1785.

Day.	Thermometer. M	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	80	84	82		29.65	29.64	29.74		40		20		20		NE	2	2	2	Cloudy
2	80	83	81		.70	.69	.77		30		20		30	0.2		1	1	1	ditto,
3	80	85	83	N. M.	.75	.74	.82		50		20		20			1	1	1	Clear,
4	81	87	85	692	.77	.73	.80		40		10		20		SE	0	1	0	ditto,
5	82	88	85		.78	.76	.84		30	10		10				0	1	0	ditto,
6	83	89	85		.80	.74	.80		30	20		0	0			0	1	0	ditto,
7	84	88	85		.76	.73	.77		20	20		10				1	0	0	ditto,
8	82	89	85		.77	.73	.80		30	10		10				1	1	0	ditto,
9	84	87	85		.80	.76	.85		20	10		0	0			0	1	0	Cloudy,
10	83	85	83	F. Q.	.83	.82	.87		20		10	0	0			0	1	0	ditto,
11	83	84	82	688	.82	.77	.80		40		20		30	0.5	E	0	1	0	ditto,
12	82	86	83		.97	.68	.73		40		20		20	0.3		1	0	1	ditto,
13	82	86	83		.68	.63	.70		40		20		20	0.6		0	0	1	ditto,
14	82	84	82		.66	.62	.69		40		20		20		NE	0	1	0	Clear,
15	81	87	83		.64	.60	.68		40		30		20			0	1	0	Cloudy,
16	81	85	83		.66	.64	.72		40		30		20	0.4	E	2	1	0	Clear,
17	81	84	81		.67	.66	.73		50		40		20	0.8	NE	2	1	1	Cloudy,
18	80	83	82	F. M	.68	.64	.70		50		40		40	0.3		2	1	2	ditto,
19	81	84	81	688	.62	.59	.66		50		40		50	0.3	SE	2	1	1	ditto,
20	80	84	80		.62	.60	.70		50		40		50	1.4		1	0	1	ditto,
21	80	82	81		.68	.72	.78		50		40		50	0.5		1	2	2	ditto,
22	80	82	81		.78	.77	.80		50		30		0	0.1		3	2	2	ditto,
23	81	87	85		.78	.72	.74		40		40		20		E	1	1	0	ditto,
24	84	87	85		.72	.66	.70		20		10		10			0	0	0	Clear,
25	83	86	82	L. Q.	.66	.62	.70		20		0		10			0	0	0	Cloudy,
26	81	83	80	686	.66	.64	.72		20		20		10	1.3	SE	1	2	2	ditto,
27	80	83	81		.66	.63	.68		30		20		20	1.7		1	1	2	ditto,
28	80	81	80		.62	.60	.67		50		50		30	0.6		1	2	2	ditto,
29	80	84	81		.66	.66	.72		50		50		50	3.5		2	2	3	ditto,
30	80	85	83		.70	.73	.78		50		20		20	0.2		0	1	1	ditto,
mean	81	85	82½		29.71	29.68	29.75		45	2	20	1	25	11.7	SE	1	1	1	

A GENERAL STATE *of the* WEATHER, *for* OCTOBER 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude	84	88	85	.83
	Leaſt ditto,	77	82	79	
	Mean ditto,	81	85½	82⅔	
BAROMETER,	Greateſt ditto,	29.98	29.96	29.98	29.91
	Leaſt ditto,	22.83	29.81	29.85	
	Mean ditto,	29.90	29.87	29.96	
	Greareſt variation,	.15	.15	.13	
HYGROMETER,	Mean denſity,	5 d. .694	24 d. .684	7 d. .692	.691

Clear,	21	days.
Cloudy,	10	ditto.
Thunder,	4	times.
Rain,	7	times.
Quantity of ditto,	1-4	inches.

THE mean heat of the ſun at mid-day 110°.
THE wind began to ſet in from the NW about the 12th and 13th.

CALCUTTA, OCTOBER 1785.

Day.	*Thermometer.* M.	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m.	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	83	85	84		29.84	29.80	29.85		30	20		10			NE	0	0	0	Clear,
2	81	85	83		.83	.82	.85		10	40		30			..	0	0	0	ditto,
3	83	87	85		.83	.81	.86	10		30		10				0	0	0	ditto,
4	82	87	84	N. M.	.85	.85	.90	10		40		10				0	0	1	ditto,
5	82	87	84	691	.88	.86	.93		0	30		0				0	0	0	ditto,
6	84	88	85		.95	.88	.92		10	10		0				0	0	0	ditto,
7	83	87	85		.90	.82	.90		0	10		0				0	0	1	ditto,
8	82	85	81		.88	.82	.90		0	10		0		0.1		1	1	1	Cloudy,
9	81	82	80		.88	.85	.91		10	0			10	0.6		1	2	2	ditto,
10	78	84	81		.91	.88	.96		10	30			10			1	1	1	ditto,
11	81	85	83	F. Q.	.96	.90	.94		10	20		10		0.1		0	1	0	Clear,
12	83	87	82	695	.94	.90	.96		0	30		10			NW	0	1	1	ditto,
13	82	87	85		.95	.90	.96		0	40		20				0	1	0	ditto,
14	83	88	85		.95	.89	.93	10		40		10				0	1	1	ditto,
15	84	88	84		.93	.91	.98		0	40		20				0	1	0	ditto,
16	83	85	85		.98	.93	.96		0	10		0				0	1	1	ditto,
17	83	87	84	F. M.	.97	.92	.93		10	40		10				1	1	0	ditto,
18	81	88	85	693	.93	.93	.93		0	30		20				1	1	0	ditto,
19	82	88	83		.92	.96	.94		0	30		20				0	1	1	ditto,
20	81	85	83		.90	.84	.96	10		50		30				1	1	1	ditto,
21	81	86	83		.90	.88	.91	20		50		30				0	1	0	ditto,
22	79	87	82		.92	.84	.89	10		50		20				0	1	1	ditto,
23	79	86	82		.91	.87	.93	10		50		30				0	1	0	ditto,
24	80	85	83		.92	.90	.95	20		40		20				1	0	0	ditto,
25	79	86	84	L. Q.	.94	.90	.94		0	30		20				0	1	0	ditto,
26	79	83	79	698	.90	.88	.90		0	20			10	0.2	SW	0	2	2	Cloudy,
27	79	82	80		.86	.82	.88		30		10		20	R	NE	0	2	1	ditto,
28	78	82	79		.87	.84	.88		30		0		20			0	2	1	ditto,
29	77	82	79		.85	.82	.92		30		10		10			0	2	2	ditto,
30	78	82	79		.90	.86	.92		30		10		10	0.3	NW	0	1	0	ditto,
31	87	82	80		.92	.90	.95		30				10	0.1	NE	0	0	0	ditto,
mean	81	85½	82⅔		29.90	29.87	29.96	3	8	25	1	10	3	1.4	NW	½	1	⅔	Clear.

A GENERAL STATE *of the* WEATHER, *for* NOVEMBER 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude,	80	85	82	
	Leaſt ditto,	67	74	71	75
	Mean ditto,	73	78½	75	
BAROMETER,	Greateſt ditto,	30.10	30.08	30.12	
	Leaſt ditto,	29.90	29.82	29.80	29.98
	Mean ditto,	29.99	29.98	30.80	
	Greateſt variation,	.20	.26	.32	
HYGROMETER,		15 d	25 d.	20 d.	
	Mean denſity,	.709	.700	.706	.705

Clear - - - 26 days.
Cloudy, - - 4 ditto.
Rain, - - - 4 times.
Quantity ditto, 0.5 inches.

MEAN heat of the ſun at mid-day 100°.

CALCUTTA, NOVEMBER 1785.

Day.	*Thermometer.*			*Mean denſity at each quarter of the Moon.*	*Barometer.*			*Hygrometer.*						*Rain.*	*Wind and Force.*				
	M.	*N.*	*E.*		*M.*	*N.*	*E.*	*M.* d.	*M.* m.	*N.* d.	*N.* m.	*E.* d.	*E.* m.		*Point.*	*M.*	*N.*	*E.*	
1	79	85	82		29.93	29.90	29.96		20	10			10		NW	0	2	0	Clear,
2	80	85	82		.95	.93	30.00		20	10			10		NE	0	2	0	ditto,
3	80	84	80	N. M.	.93	.97	29.96		20	20				R	NE	0	2	0	ditto,
4	79	81	79	696	.94	.87	.92		20				10			1	1	2	ditto,
5	77	81	79		.90	.82	.87		20				20	R		2	2	1	ditto,
6	79	82	79		.88	.85	.80		30				10			0	2	0	ditto,
7	78	81	80		.93	.90	.97		30		30			0.4		0	1	1	Cloudy,
8	77	77	75		.93	.90	.93		30		30		30			1	2	3	ditto,
9	73	76	74	F. Q.	.90	.92	.97		10		10		30		NW	1	1	0	Clear,
10	73	79	77	706	.94	.94	0.03		30	20		10				0	1	0	ditto,
11	73	80	77		30.04	30.00	.10			30		20				0	1	0	ditto,
12	75	80	76		.10	.04	.07			0		20				0	1	0	ditto,
13	74	79	75		.08	.08	.12	10		40		30				0	1	1	ditto,
14	72	77	75		.08	.03	.09	20		40		30				0	1	0	ditto,
15	72	77	75		.00	29.96	29.98	30		50		30				0	1	0	ditto,
16	72	77	75	F. M.	29.90	.93	.95	40		50		30				0	1	0	ditto,
17	73	79	76	710	.96	.96	30.00	40		50		40				0	1	0	ditto,
18	74	79	76		30.02	30.02	.06	30		40		30				0	1	0	ditto,
19	73	78	74		.06	.03	.07	30		40		30				2	0	1	ditto,
20	71	77	75		.10	.04	.11	30		40		30				1	1	1	ditto,
21	71	77	73		.07	.04	.10	10		20		10		0.1		1	2	1	Cloudy,
22	69	79	74		.05	.02	.04	10		20		10				2	2	0	Clear,
23	71	77	75	L. Q.	.01	29.94	29.97	10		20		10				0	1	1	ditto,
24	73	77	74	712	29.98	.93	.94	20		40		20				1	1	1	ditto,
25	71	77	74		.93	.90	.96	40		50		40				2	1	1	ditto,
26	71	77	72		.94	.92	.98	40		50		40				1	1	1	ditto,
27	70	75	72		30.02	30.02	30.06	40		50		40				1	1	1	ditto,
28	68	74	71		.05	.00	.05	40		50		40				1	1	1	ditto,
29	67	74	71		.05	29.97	.02	40		50		40				0	2	1	ditto,
30	67	74	72		.02	.94	.00	40		50		40				0	1	0	ditto,
mean	73	78½	75		29.99	29.98	30.00	20	7	25	1	20	3	0.5	WW	½	1½	¾	Clear.

A GENERAL STATE *of the* WEATHER, *for* DECEMBER 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude	70	76	73	
	Leaſt ditto,	63	71	66	.69
	Mean ditto,	65¾	73½	69	
BAROMETER,	Greateſt ditto,	30.09	30.06	30.10	
	Leaſt ditto,	29.97	29.90	29.99	30.01
	Mean ditto,	30.02	29.98	30.03	
	Greateſt variation,	.12	.16	.11	
HYGROMETER,		30 d.	50 d.	40 d.	
	Mean denſity,	.721	.709	.719	.716

Clear, 31 days.

THE weather throughout the month remarkably clear and pleaſant, and much milder than it is uſually at this ſeaſon of the year.

MEAN heat of the ſun at mid-day about 96°.

CALCUTTA, DECEMBER 1785.

Day.	*Thermometer.* M.	N.	E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. d.	m.	N. d.	m.	E. d.	m.	*Rain.*	*Wind and Force.* Point.	M.	N.	E.	
1	68	76	78		30.00	29.97	29.99	30		50		40		NW	WW	1	1	0	Clear,
2	70	75	72	N. M.	29.99	.95	30.00	30		50		40				0	1	0	ditto,
3	70	75	72	714	30.03	.98	.02	30		50		40				0	2	0	ditto,
4	69	75	72		.04	.98	.03	30		50		40				0	0	0	ditto,
5	68	75	71		.01	.96	.00	30		50		40				1	1	1	ditto,
6	67	75	71		29.98	.95	29.99	25		45		45				0	1	0	ditto,
7	67	74	71		.99	.96	.99	25		45		35				1	1	1	ditto,
8	67	74	69		.99	.99	30.04	30		45		35				0	1	1	ditto,
9	67	74	69	F. Q.	30.06	.99	.05	30		40		35				0	1	1	ditto,
10	67	74	69	720	.05	.97	.04	35		45		40				0	1	0	ditto,
11	67	75	70		.05	.94	.10	30		50		40				1	1	0	ditto,
12	68	75	70		.08	.99	.08	30		55		40				0	1	1	ditto,
13	66	75	70		.09	30.05	.08	30		55		40				0	2	1	ditto,
14	64	74	68		.06	.04	.09	30		55		45				0	1	0	ditto,
15	63	71	66	F. M.	.07	.03	.09	30		60		45				1	1	1	ditto,
16	63	71	67	728	.08	.02	.05	30		55		40				1	1	0	ditto,
17	63	72	67		.04	.02	.04	25		35		40				0	1	1	ditto,
18	66	73	67		.03	.00	.02	25		35		40				0	1	1	ditto,
19	64	73	68		.00	.00	.01	25		40		30				1	1	0	ditto,
20	63	73	69		29.97	29.97	.05	30		40		40				1	1	1	ditto,
21	65	73	69		30.02	.98	.02	30		50		45				0	1	1	ditto,
22	65	74	69		.00	.98	.03	35		40		30				0	1	0	ditto,
23	66	73	69	L. Q.	.05	.97	.03	35		40		30				0	1	0	ditto,
24	67	74	68	722	.03	.91	.06	35		45		35				0	1	1	ditto,
25	65	73	67		.04	.90	.02	30		45		40				0	1	1	ditto,
26	64	73	67		.00	.96	.00	30		50		40				1	1	0	ditto,
27	63	72	68		29.99	.95	.00	30		55		45				0	1	1	ditto,
28	64	73	68		.98	.97	.01	30		55		50				1	1	1	ditto,
29	64	73	67		.99	.97	.04	30		55		45				0	1	0	ditto,
30	64	73	68	N. M.	30.06	30.04	.07	30		50		40				0	1	1	ditto
31	63	74	67	728	.07	.06	.09	30		50		40				0	1	0	ditto,
mean	65¾	73½	69		30.02	29.98	30.03	30		50		40				½	1	⅔	

FROM the foregoing DIARY of the Weather, it may be remarked, in regard to the variation of the Barometer, that, during the cold ſeaſon, from November to March, the mercury is at its greateſt height, and at the loweſt during the rainy months May, June, July, Auguſt, and September. The variation of the Thermometer, or the difference between the temperature of mid-day and that of the morning and evening is very trifling, ſeldom exceeding 3 or 4° during the rains; whereas, during the cold ſeaſon, the difference is 8 or 10°.

ABSTRACT *of a* METEOROLOGICAL REGISTER, *kept at* Calcutta, 1784.

MONTH.	THERMOMETER. Morning. Lowest.	Highest.	Mean.	Noon. Lowest.	Highest.	Mean.	Evening. Lowest.	Highest.	Mean.	Difference between morn. & mid-day heat.	BAROMETER. Morning. Lowest.	Highest.	Mean.	Variation	Noon. Lowest.	Highest.	Mean.	Variation.	Evening. Lowest.	Highest.	Mean.	Variation.	Mean state atmosphere. Temperature	Weight.	Density.	Moisture. Moisture.	Rainy days.	Quantity rain.	appearance atmosphere. Number clear days.	Cloudy ditto.	Thunder No. of times.	Winds. Point.	Force.
February,	66	75	72	70	86	79	68	76	73	7													74 3/4		700	6	8	4.2	3	26	6	S	2
March,	66	84	75	75	89	84	71	85	79	9													79 1/4		692	5	3	1.8	16	15	3	S	3
April,	71	86	83	87	97	91	79	87	85	8													86 1/4		681	10	6	3.1	14	16	6	S	4
May,	75	85	81	82	93	89	74	88	84	8													84 1/4		683	15	12	9.6	7	24	13	S	2
June,	77	84	81	80	90	85	78	86	83	4													83		686	25	14	17.4	1	29	5	SE	1
July,	77	84	81	77	90	85	78	85	83	4													83		686	25	20	15.	1	30	5	S&SE	1
Auguſt,	77	83	81	80	89	85	80	84	82	4	29.57	29.75	29.67	.18	29.56	29.75	29.66	.19	29.61	29.76	29.70	.15	82 1/4	29.67	686	25	23	16.9	5	26	15	S&SE	1
September,	76	84	80	77	90	85	78	85	81 1/2	5	.72	.95	.81	.23	.68	.90	.80	.22	.75	.97	.83	.22	82 1/4	.81	690	24	12	11.3	10	20	5	S&SE	1
October,	74	83	79	77	90	86	76	85	82	7	.74	30.04	.92	.30	.77	30.02	.91	.23	.76	30.02	.92	.26	82 1/4	.91	692	2	3	.8	19	12	1	NW	1
November,	66	78	71	76	86	81	71	80	75	10	.60	.12	30.00	.52	.88	.05	.99	.17	.92	.08	30 02	.16	76	30.00	702		1	.9	23	7		NW	1
December,	58	69	63	68	79	74	65	73	68	11	30.02	.17	.09	.15	30.00	.14	30.07	.14	30.02	.17	.09	.15	68 2/3	.08	718		1	.05	26	5		NW	1
Jan. 1785.	57	70	61	69	78	72	64	74	66 1/2	11	29.98	.17	.08	.19	29.97	.14	.07	.17	.03	.17	.09	.14	66 2/3	.08	722				29	2		SW	2
Mean.	70	80 1/12	75 5/12	76 1/12	88	83	73 1/12	82 1/2	78 1/12	7 1/12	29.77	30.03	29.93	.26	29.81	30.00	29.92	.19	29.85	30.03	29.94	.18	79	29.92	695		105	81.0	154	212	59		2

ABSTRACT *of a* METEOROLOGICAL REGISTER, *kept at* Calcutta, 1785.

MONTH.	THERMOMETER. Morning. Lowest.	Highest.	Mean.	Noon. Lowest.	Highest.	Mean.	Evening. Lowest.	Highest.	Mean.	Difference between morn. & mid-day heat.	BAROMETER. Morning. Lowest.	Highest.	Mean.	Utmoſt variation.	Noon. Lowest.	Highest.	Mean.	Variation.	Evening. Lowest.	Highest.	Mean.	Variation.	Mean ſtate atmoſphere. Temperature.	Weight.	Density.	Moiſture. Moiſture.	Rainy days.	Quantity rain.	appearance atmoſphere. Number clear days.	Cloudy ditto.	Thunder No. of times.	Winds. Point.	Force.
January,	57	70	61	69	78	72	64	74	66	11	29.98	30.17	30.08	.19	29.97	30.14	30.07	.17	30.03	30.17	30.09	.14	66 2/3	30.08	722				29	2		SW	2
February,	68	74	71	75	86	79	69	76	74	8 1/2	.89	.14	.02	.25	.89	.17	.01	.28	29.96	.15	.04	.19	75	.02	706		4	2.9	17	11	4	SW	1
March,	68	80	75	80	90	85	73	83	78	10	.85	.12	29.95	.27	.84	.10	29.92	.26	.86	.13	29.97	.27	79	29.95	698		3	0.5	20	11	5	S	3
April,	69	83	79	75	91	85	74	85	82	8	.70	29.97	.83	.27	.68	29.92	.81	.24	.74	29.97	86	.23	82 1/2	.83	690		6	8.0	17	13	6	S	3
May,	79	87	83	87	94	90	80	89	85	7	.60	.96	.77	.36	.53	.92	.74	.39	.63	30.03	.82	.30	86	.77	682		10	6 0	18	13	14	S	2
June,	79	84	81	80	90	84	79	85	82	3	.44	.70	.59	.26	.40	.68	.56	.28	.47	29.72	.61	.26	83	.58	684		24	24.4	4	26	16	SE	1
July,	79	84	81	80	89	84	80	87	82	3	.44	.73	.59	.29	.45	.67	.56	.22	.47	.73	.62	.26	83	.59	684		24	12.8	4	27	11	SE	1
Auguſt,	79	84	81	80	89	84	80	86	82	3	.50	.78	.62	.28	.49	.72	.59	.23	.57	.78	.64	.26	83	.62	685		20	9.3	3	28	16	SE	1
September,	80	84	81	81	89	85	80	85	82	4	.62	.83	.71	.21	.59	.82	.68	.23	.66	.87	.75	.21	83	.71	686		16	11.7	8	22	13	S	1
October,	77	84	81	82	88	85	79	85	83	4	.83	.98	.90	.15	.81	.96	.87	.15	.85	.98	.96	.13	83	.91	691		7	1.4	21	10	4	NW	1
November,	67	80	73	74	85	78	71	82	75	5	.90	30.10	.99	.20	.82	30.08	.98	.26	.80	30.12	30.00	.32	75	.98	705		4	0.5	26	4	0		2
December,	63	70	66	71	76	73	66	73	69	7	.97	.09	30.02	.12	.90	.06	.98	.16	.99	.10	.03	.11	69	30.01	716				31				1
Tot. Mean.	72 1/2	80 1/2	76 7/12	77 10/12	87 1/12	82 5/12	74 7/12	82 6/12	78 6/12	6	29.73	29.96	29.84	.24	29.70	29.94	29.81	.24	29.75	29.96	29.87	.22	77	29.84	696		118	77.5	198	167	89		2

II.

A Synopsis of the different cases that may happen in deducing the Longitude of one place from another by means of ARNOLD's *Chronometers, and of finding the rates when the difference of Longitude is given.---By Mr.* REUBEN BURROW.

IT was formerly the custom to give rules for calculation, without any investigation of their principles; but the contrary method has so much taken place of late, that those who are not acquainted with the theory of a subject are seldom in a capacity of calculating at all; and those who are acquainted with it, must either lose time by recurring thereto continually, or run the hazard of often making mistakes. Indeed the use of practical Rules is so obvious, that NEWTON has often given them when he has omitted their demonstrations; and the want of them has been noted by BACON among the deficiencies of learning; the Hindoos were so particularly attentive in that respect, that they usually gave two rules for the same operation; one couched in the shortest terms possible, and often in verse, for the ease of the memory; and the other more at length as an explanation. It therefore is much to be wished that authors would revert to the ancient custom so far, as to pay some attention to the reduction of their knowledge to practice; that people may not be under the necessity of investigating rules, at the time that they want to use them.

THE following is one rule out of a great number, that I drew up for my own use, in determining the situations of places in India, and I insert it here on account of its utility and easiness of application.

Let E = Error of the Watch from mean time at the first place;

e = Error from mean time at the second place.

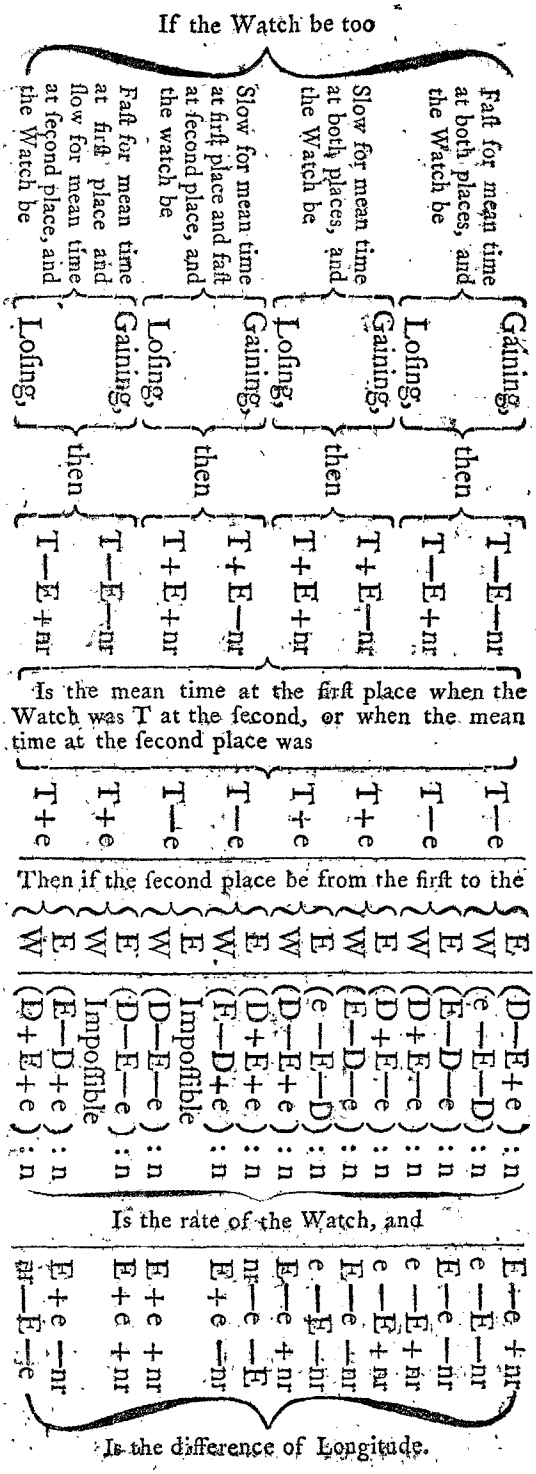
T = Time by the Watch at the second place, when the error was e;

D = Difference of Longitude between the places;

N = Interval of mean time between the observations at the two places (found by taking the interval by the Watch, and correcting it according to the estimated rate, &c.)

r = Rate of the Watch, or what it gains or loses in a day of mean time.

Then,


If the Watch be too
Fast for mean time at both places, and the Watch be
Slow for mean time at both places, and the Watch be
Slow for mean time at first place and fast at second place, and the watch be
Fast for mean time at first place and slow for mean time at second place, and the Watch be
Gaining, Losing, Gaining, Losing, then
T—E+nr T+E—nr T+E+nr T+E—nr then
T—E+nr T—E—nr T+E+nr T+E—nr then
Is the mean time at the first place when the Watch was T at the second, or when the mean time at the second place was
T—e T+e T+e T—e T+e T—e T+e T—e
Then if the second place be from the first to the
E W E W E W E W
(D—E+e) : n (e—E—D) : n (E—D—e) : n (D+E—e) : n (E—D—e) : n (D—E+e) : n (D+E+e) : n (F—D+e) : n
Impossible (D—E—e) : n Impossible (E—D+e) : n
Is the rate of the Watch, and
E—e+nr e—E—nr e—E+nr e—E+nr E—e—nr e—E—nr E+e+nr E+e—nr
E+e+nr E+e+nr E+e—nr —E—e
Is the difference of Longitude.

III.

MEMORANDUMS *concerning* AN OLD BUILDING, *in the* Hadjipore Diſtrict, *near the* Gunduck River, &c.

By Mr. REUBEN BURROW.

THE pyramids of *Egypt*, as well as thoſe lately diſcovered in *Ireland* (and probably too the *Tower* of BABEL), ſeem to have been intended for nothing more than images of MAHADEO.

Two of the *Sakkara* pyramids, deſcribed by NORDEN, are like many of the ſmall ones uſually built of mud, in the villages of *Bengal:* one of the pyramids of *Daſhour* drawn by POCOCK, is nearly ſimilar to that I am going to mention, except in the acuteneſs of the angle: moſt of the *Pagodas* of the *Carnatic* are either compleat or truncated pyramids; and an old Stone Building without any cavity, which I ſaw in *Yanbeah*, near the *Catabeda* river on the *Aracan Coaſt*, differed ſo little from a pyramid, that I did not ſuſpect it was meant for the image of SEEVA, till I was told it by the natives.

THE largeſt building of the kind which I have yet ſeen in *India*, is about two days journey up the *Gunduck* river, near a place called *Keſſereah:* it goes by the name of "BHEEM SAIN'S DEWRY," but ſeems evidently intended for the well known image of MAHADEO; having originally been a cylinder placed upon the fruſtrum of a cone for the purpoſe of being ſeen at a diſtance. It is at preſent very much decayed, and it is not eaſy to tell whether the upper part of the cylinder has been globular or conical; a conſiderable quantity of the outſide is fallen down, but it ſtill may be ſeen a good diſtance up and down the river.

THE day I went from the river to view it was ſo uncommonly hot that the walk and a fever together obliged me to truſt to the meaſurements of a ſervant: for want of a better inſtrument, he took the circumference of the cylindrical part in lengths of a ſpear, and from that as a ſcale, and a ſketch of the building taken at a diſtance, I deduced the following dimenſions: what

dependance there may be on his meaſures I cannot determine, but probably they are not very erroneous.

Diameter of the Cylindrical part, - - - - - - - - - - -	64 feet.
Height of the Cylinder, - - - - - - - - - - - - - - -	65
Height of the Conic fruſtum on which the Cylinder is placed,	93
Diameter of the Cone at the baſe, - - - - - - - - - - -	363

BOTH the Cone and the Cylinder were of bricks; thoſe of the laſt were of different ſizes, many of them two ſpans long and one broad; others were of the common ſize, but thinner; and they were well burnt, though bedded in mortar little better than mud; there did not appear any ſigns of the Cylinder being hollow: the Conical part was overgrown with jungle, but I broke through it in ſeveral places and found it every where brick.

I DO not recollect whether it be viſible from the ſite of the ancient city where the famous pillar of *Singeah* ſtands, or not; but have a faint idea that it is. What the intention of theſe extraordinary columns may have been originally, is perhaps not ſo eaſy to tell; at firſt ſight it would ſeem that they were for holding inſcriptions, becauſe thoſe of *Bettiah*, *Dehli*, and *Illahabad*, have inſcriptions, (though in a character that has not been yet decyphered); but the pillar of *Singeah* ſeems to have none whatever, for ſome *Bramins* told me they attended at the time it was dug to the foundation, near twenty feet under ground, by a gentleman of *Patna*, who had hopes to have found ſome treaſures; and that there was not the leaſt veſtige of any inſcription upon it. Probably thoſe pillars, CLEOPATRA'S needle, and the *Devil*'s bolts at *Boroughbridge*, may all have the ſame religious origin.

PERHAPS the connection of time and place may apologize for the diverſity of the ſubject, in mentioning, that while I ſat under the ſhade of a large tree near the pyramid, on account of the ſultry heat, ſome of the people of the adjacent village came and played there with *Cowries*, on a diagram that was formed by placing five points in a circular order, and joining every pair of alternate points by a line, which formed a kind of pentagon; this brought to my recollection a circumſtance told me by a gentleman in *England*, that an old piece of ſilver plate had been dug out of the earth with ſuch a figure upon it; the uſe of it was totally unknown, as well as the age; and I was deſired to find what geometrical properties the figure poſſeſſed; one I remember was, that if any number of points whatever were placed in a circular order, and each

each two alternate points joined, then the ſum of all the ſalient angles of the figure would be equal to two right angles when the number of points was odd; but equal to four right angles when the number was even. EUCLID's properties of the angles of the triangle and trapezium are particular caſes of theſe; but I had no ſuſpicion of the real intention of the figure till I ſaw the uſe here made of it. It ſeems, however, an argument in favour of the identity of the *Druids* and *Bramins*, as well as another well known diagram uſually called the "*Walls of Troy*," which was uſed originally in the *Hindoo* aſtrology: theſe figures however appear to have flowed from a much higher ſource, and to have relation to what LEIBNITZ had a diſtant idea of, in his analyſis of ſituation; EUCLID in his Poriſms, and GIRARD perhaps in his reſtitution of them: in fact, as the modern Algebraiſts have the advantage of transfering a great part of their labour from the head to the hands, ſo there is reaſon to believe that the *Hindoos* had *mechanical methods of reaſoning geometrically*, much more extenſive than the elementary methods made uſe of at preſent, and that even their games were deduced from, and intended perhaps to be examples of them: but this deſerves to be treated more at length elſewhere.

THE ſame apology may perhaps excuſe my mentioning here, that the idea of the *Nile*'s deriving its floods from the melted ſnows, as well as the *Ganges*, appears to be rather imaginary: they ſeem to be cauſed principally by the rains; for the high hills beyond the *Herdwar* apparently retain their ſnow all the year, and therefore the quantity melted could never produce the enormous ſwell of the *Ganges*; not to mention that the effect of a thaw ſeems different from what would ariſe from the mere difference of heat, and therefore might partly take place in winter and the dry ſeaſon. That the rains are ſufficient for the purpoſe without recurring to the hypotheſis of melted ſnows, appears from the following fact: A little before I obſerved the aforeſaid pyramid, I had been a conſiderable diſtance up the *Gunduck*; the river was low for the time of the year, and the hills that ſkirt the borders of *Nepaul* were clear, and apparently not above fifteen coſe diſtant; ſoon after a heavy ſhower fell upon them for ſome hours, and the river ſoon after was filled to the very banks, and continued ſo for many days, and large trees were torn up by the roots, and came driving down with ſuch force by the torrent, that my boat was often endangered. Now on theſe hills there was actually no ſnow whatever; and as the riſe was obviouſly cauſed by the rains, it may reaſonably be concluded that the ſame effect has the ſame cauſe in other places.

IV.

IV.

OBSERVATIONS *of ſome of the* Eclipſes of JUPITER's Satellites.

By Mr. REUBEN BURROW.

The following in the Ganges *and* Burrampooter Rivers.

Apparent time, 1787. d.	h.	′	″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
Sept. 23	11	41	9	2	Moderate,	Imm.	Bankipore Granary,
24	15	41	22	3	Ditto,	Imm.	Ditto,
Oct. 11	12	45	14	1	Ditto,	Imm.	Colgong; Cleveland's Bungalo,
23	10	26	20	3	Ditto,	Emer.	Mouth of Jellingy,
25	11	47	39	2	Ditto,	Imm.	Shore of Ganges, South of Pubna,
25	16	42	40	1	Ditto,	Imm.	Ditto,
27	11	13	59	1	Ditto,	Imm.	Coſſundah; Nullah,
30	14	35	16	3	Ditto,	Emer.	Dacca; Nabob's Houſe,
Nov. 19	8	56	32	2	Ditto,	Imm.	Tealcopee, Burrampooter.
26	11	33	45	2	Ditto,	Imm.	Bakkamar Chorr,
26	13	13	57	1	Ditto,	Imm.	Ditto,
28	7	42	52	1	Ditto,	Imm.	Cazycotta,
Dec. 3	14	10	54	2	Hazy,	Imm.	Goalparah,
3	15	8	1	1	Moderate,	Imm.	Ditto,
5	7	51	59	3	Ditto,	Imm.	Ditto,
5	9	35	26	1	Ditto,	Imm.	Ditto,
10	16	41	54	2	Very Hazy,	Imm.	Budjrapore,
10	16	56	17	1	Moderate,	Imm.	Ditto,
12	11	26	9::	1	Hazy,	Imm.	Tingarchor,
12	11	48	40:	3	Ditto,	Imm.	Ditto,
19	15	28	59	1	Ditto,	Emer.	Luckipore,

The following on the Arracan Coaſt.

Apparent time, 1788. d.	h.	′	″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
Feb. 5	10	18	12:	1	Moderate,	Emer.	Cheduba, Flag Staff point,
12	12	13	54	1	A little hazy,	Emer.	Ditto, Maykawoody Fort,
21	8	39	29	1	Moderate,	Emer.	Yambeah Ty Fort,
23	10	57	53	2	Ditto,	Emer.	Ditto, Kyaonemo,
28	10	35	13	1	Ditto,	Emer.	Cheduba; Cedar point.

The following were obſerved at Colonel WATSON's Docks, *at* Kidderpore, *near the mouth of the* Nullah.

Apparent time, 1788. d.	h.	′	″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
March, 15	8	36	36	1	Moderate,	Emer.	
19	7	54	2	2	Ditto,	Emer.	
22	10	34	41	1	Ditto,	Emer.	
31	7	1	24	1	Ditto,	Emer.	

The following in the Ganges *and* Rohilcund, *&c.*

Apparent time, 1788. d.	h.	′	″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Observation.*
Oct. 8	14	35	30	3	Moderate,	Emer.	Bankipore,
29	14	3	4	1	Ditto,	Imm.	Benares, Obſervatory,
Nov. 1	15	42	36	2	Ditto,	Imm.	Chunar Camp,
12	17	44	23	1	Hazy,	Imm.	Illahabad Fort,
14	12	11	29	1	Ditto,	Imm.	Correahcotta,
20	10	48	28	3	Moderate,	Imm.	In the Ganges, 3 m. below Nudjiff Ghur,
20	14	9	52::	3	Ditto,	Emer.	
21	13	58	32	1	Ditto,	Imm.	Jaujemow,
27	14	44	29	3	Ditto,	Imm.	Cawnpore; Magazine Gaut,
28	15	49	22	1	Ditto,	Imm.	Ditto,
30	10	17	2	1	Ditto,	Imm.	Ditto,
Dec. 3	15	2	23	2	Ditto,	Imm.	Joognagpore Gaut,
7	12	6	5	1	Ditto,	Imm.	East of Cannouge, 0° 2′ 29″,
14	13	54	57	1	Ditto,	Imm.	Futtygur, Magazine,
21	9	20	53	2	Ditto,	Imm.	Ditto Dr. Cook's Gaut,
21	15	44	51	1	Ditto,	Imm.	Ditto,
23	10	12	34	1	Ditto,	Imm.	Ditto,
28	17	35	22::	1	Hazy,	Imm.	Cutterah,
30	12	2	48	1	Moderate,	Imm.	Fereedpore,
1789.							
Jan. 4	14	26	28	2	Ditto,	Imm.	Nabobgunge,
6	13	53	41	1	Ditto,	Imm.	Pillibeat; Eed Gah,
8	8	20	16:	1	Ditto,	Imm.	Shairgurr,
9	14	10	39	3	Ditto,	Imm.	Bowerkah.
22	14	15	50	1	Ditto,	Emer.	Bhyrah,
24	8	44	1	1	Ditto,	Emer.	Takoordwar,
29	14	15	36	2	Ditto,	Emer.	Nidjibabad,
29	16	7	14	1	Hazy,	Emer.	Ditto,
Feb. 14	13	22	49	3	Moderate,	Emer.	Amrooah,
14	14	23	40	1	Ditto,	Emer.	Ditto,
16	8	48	8	2	Ditto,	Emer.	Huſſenpore,
16	8	51	53	1	Hazy,	Emer.	Ditto,
17	6	53	11:	4	Ditto,	Imm.	Seerſah,
17	11	6	44:	4	Ditto,	Emer.	Ditto,
23	10	50	1	1	Ditto,	Emer.	Chandowſy,
March, 2	12	48	13	1	Moderate,	Emer.	Futtyghur, Dr. Cook's Gaut,
2	14	11	10	2	Ditto,	Emer.	Ditto,
11	9	22	21	1	Ditto,	Emer.	Mobarickpore Gaut,
18	11	23	56	1	Ditto,	Emer.	Chunar Fort,
20	9	4	40	2	Ditto,	Emer.	Benares, Obſervatory,
27	7	59	16	1	Ditto,	Emer.	Bankypore, Granary,
27	11	53	1	2	Ditto,	Emer.	Ditto,
29	10	31	10	3	Ditto,	Imm.	Ditto,
April 3	9	56	45:	1	Ditto,	Emer.	Patna; Chehelſuttoon,
10	11	59	48:	1	Very Hazy,	Emer.	Mongeer, Rocky Point,
19	8	30	56	1	Hazy,	Emer.	Rajmahal,
26	10	31	22	1	Moderate,	Emer.	Teacally Dumdumma,

The following were obſerved at Ruſſahpugly, *near* Calcutta.

Apparent time, 1789. d. h. ′ ″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
May 12 8 48 50	1	Moderate,	Emer.	
Dec. 19 11 59 15	1	Hazy,	Imm.	
19 14 5 33	3	Ditto,	Imm.	
22 11 23 4	2	Moderate,	Imm.	
26 13 49 38	1	Ditto,	Imm.	
1790.				
Jan. 2 15 39 32	1	Ditto,	Imm.	
18 13 49 51	1	Miſt & wind	Imm.	
23 10 44 48	2	Ditto,	Imm.	
24 9 40 57	3	Hazy,	Imm.	
27 10 8 19	1	Moderate,	Imm.	
31 13 36 35	3	Very Hazy,	Imm.	
Feb. 1 17 32 48	1	Hazy,	Imm.	
3 12 1 30	1	Moderate,	Imm.	
17 10 38 18	2	Ditto,	Emer.	
19 12 33 56	1	Ditto,	Emer.	
26 14 28 38	1	Hazy,	Emer.	
28 8 57 22	1	Moderate,	Emer.	
March 1 9 0 52	3	Ditto,	Emer.	
5 16 24 13	1	Hazy,	Emer.	
16 7 18 14	1	Moderate,	Emer.	
23 9 14 25	1	Ditto,	Emer.	
26 7 36 11	4	Ditto,	Imm.	

The two following were at Jowgatta, *near* Kriſhnagur.

Apparent time, 1790. d. h. ′ ″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
April, 22 10 27 50	2	Moderate,	Emer.	
22 11 31 10	1	Ditto,	Emer.	

Thoſe to the 31ſt of March, 1788 were obſerved with a glaſs made by WATKINS that magnified about 110 times; thoſe from thence to the 12th of May, 1790, were obſerved with one of RAMSDEN's teleſcopes of the ſort lately made for the Navy, and the remainder with a glaſs made by DOLLAND that magnifies about eighty times.

I ſhall conclude theſe obſervations with a remark that highly concerns both the buyers and makers of teleſcopes; namely, that the parts which compoſe the object glaſs of an Achromatic, are generally put together in ſuch a manner that they cannot be taken aſunder; and the braſs part that they are bedded in, ſhoots a number of chymical ramifications between the glaſſes, that in the courſe of a year renders a teleſcope of little or no ſervice. This defect the maker may eaſily remove by making the compound object glaſs capable of being taken to pieces, or the parts in ſome other ſubſtance not liable to this defect.

III.

A Proof that the Hindoos *had the* Binomial Theorem.

By Mr. REUBEN BURROW.

THE *Iſlands* in the bay of *Bengal* are many of them covered with ſhells and marine productions to a great height, and there are beds of large ſmooth pebbles near the *Herdwar* ſome hundreds of feet above the preſent level of the *Ganges*; the ſea has therefore gradually been retiring, and conſequently the poſition of the Equator was formerly farther north than it is at preſent in this part of the earth: and if a few ſimilar obſervations were made in other countries, it is evident that the ancient ſituation of the pole upon the ſurface of the earth might be determined ſufficiently near for explaining many difficulties and paradoxes in Geographical antiquities; for this purpoſe alſo, it would be adviſeable to have permanent meridian lines drawn in high northern latitudes, to be compared in ſucceeding ages, and alſo to have marks cut upon rocks in the ſea, to ſhew the proper level of the water.

In the aforeſaid poſition of the Equator, the ſands of *Tartary* were inhabitable and the Siberian climates temperate; the deſerts of the leſſer *Buckharia* were then part of the ſeat of the *Paradiſe of Moſes*; and the four ſacred rivers of *Eden* went through *India*, *China*, *Siberia*, and into the *Caſpian Sea*, reſpectively; this appears from a *Bramin* map of the world in the *Sanſcrit language* which I met with about two years ago in the higher parts of *India*, togethe with a valuable Treatiſe of Geography upon the ſyſtem of *Boodh*; both o which I communicated, with my idea on the ſubject, to Mr. Wilford, of the *Bengal* Engineers; and from him the world may expect ſhortly to be favoured with the firſt true repreſentation of Scriptural and *Hindoo* Geography.

From the aforeſaid country the *Hindoo* religion probably ſpread over the whole earth: there are ſigns of it in every northern country, and in almoſt every ſyſtem of worſhip: in *England* it is obvious; Stonehenge is evidently one of the Temples of *Boodh*; and the Arithmetic, the Aſtronomy, Aſtrology, the Holidays, Games, names of the Stars and figures of the Conſtellations; the ancient Monuments, Laws, and even the languages of the different nations, have the ſtrongeſt marks of the ſame original. The worſhip of the ſun and fire; human and

animal ſacrifices, &c. have apparently once been univerſal: the religious ceremonies of the papiſts ſeem in many parts to be a mere ſervile copy of thoſe of the *Goſeigns* and *Fakeers*; the Chriſtian Aſcetics were very little different from their filthy original the *Byraggys*, &c.; even the hell of the northern nations is not at all like the hell of the ſcripture, except in ſome few particulars; but it is ſo ſtriking a likeneſs of the hell of the *Hindoos*, that I ſhould not at all be ſurpriſed if the ſtory of the ſoldier that ſaw it in SAINT PATRICK's purgatory, deſcribed in MATTHEW PARIS's hiſtory, ſhould hereafter turn out to be merely a tranſlation from the *Sanſcrit* with the names changed. The different tenets of *Popery* and *Deiſm* have a great ſimilarity to the two doctrines of *Brahma* and *Boodh*; and as the *Bramins* were the authors of the Ptolemaic ſyſtem, ſo the *Boodhiſts* appear to have been the inventors of the ancient *Philolaic* or *Copernican*, as well as of the doctrine of attraction; and probably too, the eſtabliſhed religion of the *Greeks* and the *Eleuſinian* myſteries may only be varieties of the two different ſects. That the *Druids* of *Britain* were *Bramins* is beyond the leaſt ſhadow of a doubt; but that they were all murdered and their ſciences loſt, is out of the bounds of probability; it is much more likely that they turned Schoolmaſters and Freemaſons and Fortune-tellers, and in this way part of their ſciences might eaſily deſcend to poſterity, as we find they have done: an old paper, ſaid to have been found by *Locke*, bears a conſiderable degree of internal evidence both of its own antiquity and of this idea; and on this hypotheſis it will be eaſy to account for many difficult matters that perhaps cannot ſo clearly be done on any other, and particularly of the great ſimilarity between the *Hindoo* ſciences and ours: a compariſon between our eldeſt ſcientific writers and thoſe of the *Hindoos*, will ſet the matter beyond diſpute; and fortunately the works of *Bede* carry us twelve hundred years back, which is near enough to the times of the *Druids* to give hopes of finding their remains: I ſhould have made the compariſon myſelf, but *Bede* is not an author to be met with in this country; however, I compared an Aſtrolabe in the *Nagry* character (brought by Dr. MACKINNON from *Jynagur*) with CHAUCER's deſcription, and found them to agree moſt minutely; even the center pin, which CHAUCER calls "the horſe," has a horſe's head upon it in the inſtrument; therefore if CHAUCER's deſcription ſhould happen to be a tranſlation from *Bede*, it will be a ſtrong argument in favour of the hypotheſis; for we then could have nothing from the *Arabians*. What *Bungey* and *Swiſſet* may contain, will alſo deſerve enquiry; and that the compariſon

compariſon may be the readier made, where the books are procurable, I mean very ſhortly to publiſh tranſlations of the *Leelavotty* and *Beej Ganeta*, or the Arithmetic and Algebra of the *Hindoos*.

It is much to be feared, however, that many of the beſt treatiſes of the *Hindoos* are loſt, and that many of thoſe that remain are imperfect; by the help of a *Pundit*, I tranſlated part of the *Beej Ganeta* near ſix years ago, when no *European* but myſelf, I believe, even ſuſpected that the *Hindoos* had any Algebra; but finding that my copy was imperfect, I deferred compleating the tranſlation in hopes of procuring the remainder; I have ſince found a ſmall part more, and have ſeen many copies; but from the plan of the work (which in my opinion is the beſt way of judging) they ſtill ſeem all to be imperfect, though the copier generally takes care to put at the end of them that they are compleat. I have the ſame opinion of the *Leelavotty*, and for the ſame reaſon; indeed, it is obvious that there muſt have been treatiſes exiſting where Algebra was carried much farther; becauſe many of their rules in Aſtronomy are approximations deduced from infinite ſeries; or, at leaſt, have every appearance of it; ſuch for inſtance as finding the ſine from the arc, and the contrary; and finding the angles of a right angled triangle from the hypothenuſe and ſides, independant of tables of ſines; and ſeveral others of a ſimilar nature much more complicated. I have been informed by one of their *Pundits*, that ſome time ago, there were other treatiſes of Algebra beſides that juſt mentioned, and much more difficult, though he had not ſeen them; and therefore as it is possible they may ſtill be exiſting, and yet be in danger of periſhing very ſoon, it is much to be wiſhed that people would collect as many of the books of ſcience as possible, (their poetry is in no danger), and particularly thoſe of the doctrine of BOODH, which perhaps may be met with towards *Thibet*. That many of their beſt books are depraved and loſt is evident, becauſe there is not now a ſingle book of geometrical elements to be met with; and yet that they had elements not long ago, and apparently more extenſive than thoſe of EUCLID, is obvious from ſome of their works of no great antiquity: the ſame remarks are applicable to their Coſmographical remains, in ſome of which there are indications of an Aſtronomy ſuperior to that of the SOORYA SIDDHANT, and ſuch popular treatiſes.

TILL we can therefore find ſome of their more ſuperior works, it muſt be rather from the form and conſtruction of their aſtronomical tables and rules, and the properties implied in their accidental ſolutions of queſtions, &c. that we can judge what they formerly knew, than otherwiſe; that they were acquainted

quainted with a differential method ſimilar to NEWTON's, I ſhall give many reaſons for believing, in a treatiſe on the principles of the *Hindoo* Aſtronomy, which I began more than three years ago, but was prevented from finiſhing, by a troubleſome and laborious employment that for two years gave me no leiſure whatever; and which (though the ſmall time I had to ſpare ſince has been employed in writing a comment on the works of NEWTON, and explaining them to a very ingenious native who is tranſlating them into *Arabick*) I hope ere long to have an opportunity of compleating: at preſent I ſhall only give an extract of a paper explaining the conſtruction of ſome tables, which firſt led me to the idea of their having a differential method; it is part of one out of a number of papers that were written in the latter part of the year 1783, and the begining of 1784, and of which ſeveral copies were taken by different people, and ſome of them ſent to *England*: this particular extract, was to inveſtigate the rules at pages 253, 254, and 255, of Monſ. GENTIL's Voyage, of which the Author ſays, "Je n'ai pu ſavoir ſur quels principes cette table eſt fondée, &c." and is as follows:

"Now, by proceeding in the manner explained in the aforeſaid paper to cal-
"culate the right aſcenſion and aſcenſional difference for *Tirvalour*, and after-
"wards taking the differences Algebraically, and reducing them to puls of a
"*Gurry*, as in the following table, the principles of the method will be evi-
"dent.

S.	Obl. Aſcens. R. A.	Aſc. diff.	First diff. of Obl. Aſcenſion.	Ditto reduced to Puls of a Gurry.	Do. farther reduced.
	° ′	° ′	° ′		
0	0	0—0 0			
1	27	54—2 19	27 54—2 19	279—23	256
2	57	49—4 13	29 55—1 54	299—19	280
3	90	0—4 59	32 11—0 46	322— 8	314
4	122	11—4 13	32 11+0 46	322+ 8	330
5	152	6—2 19	29 55+1 54	299+19	318
6	180	0+0 0	27 54+2 19	279+23	302
7	200	54+2 19	27 54+2 19	279+23	302
8	237	49+4 13	29 57+1 54	299+19	318
9	270	0+4 59	32 11+0 46	322+ 8	330
10	302	11+4 13	32 11—0 46	322— 8	314
11	332	6+2 19	29 55—1 54	299—19	280
12	360	0+0 0	27 54—2 19	279—23	256

"The

" The fifth and ſixth columns ſufficiently explain the tables in page 253 and " 254 of M. *Gentil*; but there remains a part more difficult, namely, why in " calculating the *Bauja*," or the doubles of the firſt differences of the aſcenſional " difference " $\frac{20}{60}$ of the length of the ſhadow is taken for the firſt; $\frac{4}{5}$ of the " firſt term for the ſecond, and $\frac{1}{3}$ of the firſt term for the third?" " The pri- " mary reaſon of taking differences here, ſeems to be, that the chords may be " nearly equal to the arcs, and that, by adding of the differences, the arcs " themſelves may be found nearly; the reaſon will appear from the following " inveſtigation. Let N be the equatorial ſhadow of the *Bramins* in *Bingles*, " then 720 the length of the *Gnomion*, or twelve *Ongles*, will be to N the ſha- " dow, as radius to the tangent of the latitude; and radius to the tangent of the " latitude as the tangent of the declination to the ſine of the aſcenſional dif- " ference; conſequently, 720 is to N as the tangent of declination to the ſine " of the aſcenſional difference. Now, if the declinations for one, two, and " three ſines be ſubſtituted in the laſt proportion, we get the ſines of the three " aſcenſional differences in terms of N and known quantities; and, if theſe " values be ſubſtituted in the Newtonian form for finding the arc from the ſine, " we get the arcs in parts of the radius; and if each of theſe be multiplied by " 3600 and divided by 6,28318, the values comes out in puls of a *Gurry* if N " be in *Bingles*, but in parts of a *Gurry* if N be in *Ongles*; and by taking the " doubles, we get the values nearly as follow:

Values.	*Difference*	
0,00000 N		
0,33056 N	0,33056 N = 1-3 N nearly,	the values
0,59928 N	0,26872 N = 4-5 of 1-3 N nearly,	uſed by the
0,70860 N	0,10932 N = 1-3 N nearly,	*Bramins.*

" Now, becauſe the values in the firſt column are doubles of the aſcenſional " differences for one, two, and three ſines, their halves are the aſcenſional dif- " ferences in parts of a *Gurry*, ſuppoſing N to be in *Ongles*; and if each of " theſe halves be multiplied by ſixty, the products, namely, 9,9168 N, " 17,9784 N, and 21,2580 N will be the ſame in puls of a *Gurry*; and if to " get each of theſe nearly in round numbers, the whole be multiplied by " three, and afterwards divided by three, the three products will be 29,75 N. " 53,94 N, and 63,77 N, which are nearly equal to thirty N; fifty-four N, " and ſixty-four N reſpectively; and hence the foundation of the *Bramin* rule " is evident, which directs to multiply the equatorial ſhadow by thirty, fifty-

" four,

" four, and ſixty-four reſpectively; and to divide the products by three for the " *Chorardo* in puls: and theſe parts anſwer to one, two, and three ſigns of lon- " gitude from the true equinox; and therefore the *Ayanongſh*, or *Bramin* pre- " ceſſion of the equinox, muſt be added to find the intermediate *Chorardo* by " proportion."

Though the agreement of this inveſtigation with the *Bramin* reſults, is no proof that the *Hindus* had either the differential method, or Algebra, it gave me at the time a ſtrong ſuſpicion of both; and yet, for want of knowing the name that Algebra went by in *Sanſcrit*, I was near two years before I found a treatiſe on it, and even then I ſhould not have known what to enquire for, if it had not come into my mind to aſk how they inveſtigated their rules. Of the differential method, I have yet met with no regular treatiſe, but have no doubt whatever that there were ſuch, for the reaſons I have before hinted; and I hope others will be more fortunate in their enquiries after it than myſelf.

With reſpect to the *Binomial Theorem*, the application of it to fractional indices will perhaps remain for ever the excluſive property of *Newton*; but the following queſtion and its ſolution evidently ſhew that the *Hindus* underſtood it in whole numbers to the full as well as *Briggs*, and much better than *Paſcal*. Dr. *Hutton*, in a valuable edition of *Sherwin*'s tables, has lately done juſtice to *Briggs*; but Mr. *Whitchell*, who ſome years before pointed out *Briggs* as the undoubted inventor of the differential method, ſaid he had found ſome indications of the *Binomial Theorem* in much older authors. The method, however, by which that great man inveſtigated the powers independant of each other, is exactly the ſame as that in the following tranſlation from the *Sanſcrit*.

" A RAJA's palace had eight doors; now theſe doors may either be opened " by one at a time; or by two at a time; or by three at a time; and ſo on " through the whole, till at laſt all are opened together: it is required to tell " the numbers of times that this can be done?

" Set down the number of the doors, and proceed in order gradually decreaſ- " ing by one to unity, and then in a contrary order, as follows:

8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8

" DIVIDE the firſt number eight by the unit beneath it, and the quotient " eight ſhews the number of times that the doors can be opened by one at a " time:

"time: multiply this laſt eight by the next term ſeven, and divide the product "by the two beneath it, and the reſult twenty-eight is the number of times "that two different doors may be opened: multiply the laſt found twenty-"eight by the next figure ſix, and divide the product by the three beneath it, "and the quotient fifty-ſix, ſhews the number of times that three different "doors may be opened: again, this fifty-ſix multiplied by the next five, and di-"vided by the four beneath it, is ſeventy, the number of times that four differ-"ent doors may be opened: in the ſame manner fifty-ſix is the number of fives "that can be opened; twenty-eight the number of times that ſix can be "opened: eight the number of times that ſeven can be opened; and laſtly, "one is the number of times the whole may be opened together, and the ſum "of all the different times is 255."

THE demonſtration is evident to mathematicians; for as the ſecond term's coefficient in a general equation ſhews the ſum of the roots, therefore in the n power of $1+1$, where every root is unity, the coefficient ſhews the different *Ones* that can be taken in n things: alſo becauſe the third term's coefficient is the ſum of the products of all the different twos of the roots, therefore when each root is unity, the product of each two roots will be unity, and therefore the number of units, or the coefficient itſelf, ſhews the number of different *twos* that can be taken in n things. Again, becauſe the fourth term is the ſum of the products of the different threes that can be taken among the roots, therefore when each root is unity, the product of each three will be unity, and therefore every unit in the fourth will ſhew a product of three different roots, and conſequently the coefficient itſelf ſhews all the different *threes* that can be taken in n things; and ſo for the reſt. I ſhould not have added this, but that I do not know well where to refer to it.

P. S. THERE is an obſervation perhaps worth remarking, with reſpect to the change of the POLES; namely, that the ſmall rock Oyſters are generally all dead within about a foot above high water mark; now, poſſibly, naturaliſts may be able to tell the age of ſuch ſhells nearly by their appearance; and if ſo, a pretty good eſtimate may be formed of the rate of alteration of the level of the ſea in ſuch places where they are; for I made ſome aſtronomical obſervations on a rock in the ſea, near an iſland about ſeven miles to the ſouth of the iſland of *Cheduba*, on the *Aracan Coaſt*, whoſe top was eighteen feet above high water

mark, and the whole rock covered with thoſe ſhells faſt grown to it, but all of them dead, except thoſe which were a foot above the high water mark of that day, which was February 2, 1788: the ſhells were evidently altered a little in proportion to their height above the water, but by no means ſo much as to induce one to believe that the rock had been many years out of it: all the adjacent iſlands and the coaſt ſhewed ſimilar appearances, and therefore it was evidently no partial elevation by ſubterranean fires, or any thing of that ſort: this is alſo apparent from the iſland of *Cheduba* itſelf, in which there is a regular ſucceſſion of ſea beaches and ſhells more and more decayed to a great height. By a kind of vague eſtimation from the trees and the coaſts and ſhells, &c. (on which, however, there is not the leaſt dependance) I ſuppoſed that the ſea might be ſubſiding at the rate of about three inches in a year.

ASIATICK RESEARCHES:

OR,

TRANSACTIONS

OF THE

SOCIETY INSTITUTED IN BENGAL,

FOR INQUIRING INTO THE

HISTORY AND ANTIQUITIES, THE ARTS, SCIENCES, AND LITERATURE,

OF

A S I A.

VOLUME THE THIRD.

A Garrow Man in his War Dress.

I.

THE EIGHTH ANNIVERSARY DISCOURSE.—*See the Works of Sir William Jones, Vol. I. p.* 113.

II.

OBSERVATIONS ON THE INHABITANTS OF THE GARROW HILLS,

MADE DURING A PUBLIC DEPUTATION IN THE YEARS 1788 AND 1789.

By JOHN ELIOT, *Esq.*

IN the month of *September* 1788, I was deputed by Government to inveſtigate the duties collected on the *Garrow* hills, which bound the north-eaſtern parts of *Bengal*; and, to conciliate the good-will of the people, who had hitherto known no intercourſe with *Europeans*, ſome ſcarlet cloth was given me by Government to be diſtributed to them.

The mountaineers, who inhabit different parts of *India*, have been generally conſidered ſavages, equally unreſtrained by law and morality, and watchful to take every opportunity of committing depredations on the low country, pillaging the inhabitants, and deſtroying their villages, whenever they could do ſo with impunity. At *Boglepore*, however, it has been proved, that the hill-people, by good treatment and encouragement, may be in a great degree civilized, and rendered at leaſt peaceable and inoffenſive, if not ſerviceable: my obſervation of the character and the conduct of the *Garrows* has induced me to believe the ſame good conſequences may be expected from encouraging them; but I propoſe to relate in plain language what I experienced on my viſit to them, and leave others to form their own judgment; and, as I am the firſt *European* who has travelled among them, I ſhall alſo add a few obſervations on the country, and on what attracted my notice as being in any reſpect peculiar.

On drawing near the hills you have a beautiful ſight of three ranges of mountains, riſing one above another; but on nearer approach they vaniſh, except the

Gonaſſers,

Gonaſſers, the lower range, in appearance, inſignificantly ſmall. The verdure and rich land, however, fully recompenſe the loſs; and, turn your eye which way you will, you ſee ſomething to cheer the mind, and raiſe the fancy, in the numerous ſmall villages round about, protected from the heat by a variety of trees interſperſed.

The firſt paſs I went to, was *Ghoſegong*, ſituated on the weſt ſide of the *Natie* river. Here a great number of *Garrows* reſide at the foot of the paſs in three villages, *Ghoſegong*, *Ghonie*, and *Borack*. The head people of the villages are called *Boneahs*, a name uſed by the head *Rájás* in *Bengal*, when the king reſided at *Gour*. Whence they derived this name, I could not learn; and many other things, which might lead to diſcoveries, eſcaped my knowledge from the want of a good interpreter.

ODASSEY BOONEAH is looked on as the head man of this paſs at preſent, having moſt influence with his ſect; but the rightful chief is MOMEE, a woman, and her power being, by eſtabliſhed uſage, transferrable by marriage to her huſband, he ought in conſequence to preſide; but, from his being a young and ſilly man, the chiefſhip is uſurped by ODASSEY, and his uſurpation is ſubmitted to by MOMEE and her huſband. ODASSEY however is by no means a violent or artful man. He is far from poſſeſſing a bad diſpoſition, is a mild man, and by all accounts takes great pains to do juſtice, and keep up unanimity with his people.

The village *Ghoſegong* is ſurrounded by a little jungle. On paſſing it, the village is opened to your ſight, conſiſting of *Chaungs* or Houſes from about thirty to 150 feet long, and twenty or forty broad.

Theſe *Garrows* are called by the villagers and upper hill people *Counch Garrows*, though they themſelves, if you aſk them of what caſt they are, will anſwer *Garrows*, and not give themſelves any appellation of caſt, though there are many caſts of *Garrows*, but with what differences I had not time to aſcertain.

The ſoil is of a fine black earth, here and there intermixed with ſpots of red earth: its richneſs is plainly ſeen from the quickneſs of vegetation. The rice is in many places equal to the *Benares* long rice. The muſtard ſeed is twice as big as any produced in the pergunnahs of *Bengal*, where I have been, and the oil it produces, is as ſuperior to, as the ſize of its grain is greater than, any other. The hemp is equally good, but, as to its ſuperiority to what may be produced in other pergunnahs, I am unable to ſpeak with certainty: as far as I can judge from my own obſervation, the ſort brought to the *Calcutta* market is not equal to what is produced on the borders of the hills. The paſture for cattle may be claſſed next in

quality

quality to that of *Plaſſy* plain; and this I infer from its being generally known, the *Sheerpour* and *Suſung* ghee is nearly as good as that made at *Plaſſy*.

There are rivers at the ſeveral paſſes. Thoſe of note are the *Natie*, *Mahareeſee*, *Summaſſerry*, and *Mahadeo*. On the weſt ſide of the *Natie* is *Ghoſegong*, and on the eaſt the *Suffoor* paſs. *Abrahamabad* or *Bygombarry* is on the eaſt ſide of the *Mahareeſee*; *Aughur*, on the eaſt of *Summaſſerry*; and *Burradowarrah*, on the weſt of *Mahadeo*. Theſe rivers are all of a ſandy and gravelly bottom, with much limeſtone and iron. The *Mahadeo* has abundance of coals, the oil of which is eſteemed in the hills as a medicine for the cure of cutaneous diſorders, and is reputed to have been firſt diſcovered to the hill people and villagers by a *Fakeer*. The mode of extracting the oil is ſimple. A quantity of coals are put into an earthen pot, the mouth of which is ſtopped with long graſs by way of ſtrainer. This pot is put into a large deep pan, perforated at the bottom, ſo as to admit of the neck of the pot being put through it; the pan is ſupported upon bricks to prevent the neck of the pot from touching the ground, and alſo that a veſſel may be placed under the ſtrainer as a reſervoir for receiving the oil as it drops. The pan is filled with dry cow dung, which is uſed as fuel, and extracts the oil in the courſe of an hour.

There are but few ſorts of fiſh in theſe rivers: turtle are to be had in great numbers, and are always conſecrated by ſacrifice before they are eaten. The hill people are however fully recompenſed for the loſs of fiſh in the rivers, by the great abundance they get from the neighbouring lakes.

A *Garrow* is a ſtout well-ſhaped man, hardy and able to do much work; of a ſurly look, flat *Cáfri* like noſe, ſmall eyes, generally blue, or brown, forehead wrinkled, and overhanging eye-brow, with large mouth, thick lips, and face round and ſhort; their colour is of a light or deep brown; their dreſs conſiſts of a brown girdle, about three inches broad; having in the centre a blue ſtripe; it goes round the waiſt, is paſſed between the thighs, and is faſtened behind, leaving one end or flap hanging down before, about eight inches; ſometimes it is ornamented with braſs-plates; with rows of ivory or a white ſtone ſhaped like bits of tobacco-pipes, about half an inch long; the braſs plate is made to reſemble a button, or an apothecary's weight, but more indented: ſome have it ornamented with little bits of braſs, ſhaped like a bell: ſome wear an ornament on their head about three or five inches broad, decorated in the ſame manner as the flap, ſerving to keep their hair off the face, which gives them a wild fierce appearance. Some tie their hair on the crown, in a looſe careleſs manner, while others crop it cloſe. The *Booneahs* or chiefs

chiefs wear a ſilk turban; to the girdle they affix a bag containing their money and *pawns*, and alſo a net for holding the utenſils with which they light their pipe hung near to it by a chain.

The women are the ugliеſt creatures I ever beheld, ſhort and ſquat in their ſtature, with maſculine faces, in the features of which they differ little from the men. Their dreſs conſiſts of a dirty red cloth, ſtriped with blue or white, about ſixteen inches broad, which encircles the waiſt, and covers about three-fourths of the thigh. It never reaches to the knee, and being but juſt long enough to tie above on the left ſide, part of the left thigh, when they walk, is expoſed. On their necks they have a ſtring of the ornaments above deſcribed reſembling tobacco-pipes, twiſted thirty or forty times round, but negligently, without any attention to regularity; their breaſts are expoſed to view, their only clothing being the girdle abovementioned; to their ears are affixed numbers of braſs rings, increaſing in diameter from three to ſix inches: I have ſeen thirty of thoſe rings in each ear; a ſlit is made in the lobes of the ear, which increaſe from the weight of the rings and in time will admit the large number ſtated. This weight is however partly ſupported by a ſtring, which paſſes over their heads; a tape three inches broad ties their hair, ſo as to keep it back from their foreheads, though generally it is tied with a ſtring on the crown of the head. The wives of the *Booneahs* cover their heads with a piece of coarſe cloth, thirteen or fourteen inches broad, and two feet long, the end of which with their hair, hangs down behind, flowing looſe on their backs. The women work as well as the men, and I have ſeen them carry as great burthens. Their hands, even thoſe of the wives of the *Booneahs*, bear evident marks of their laborious occupations.

Theſe people eat all manner of food, even dogs, frogs, ſnakes, and the blood of all animals. The laſt is baked over a ſlow fire in hollow green bamboos, till it becomes of a naſty dirty green colour. They are fond of drinking to an exceſs. Liquor is put into the mouth of infants, almoſt as ſoon as they are able to ſwallow: they have various ſorts of ſpirits, but that moſtly drunk is extracted from rice, ſoaked in water for three or four days before uſe. Their cookery is ſhort, as they only juſt heat their proviſions; excepting rice and guts, the firſt of which is well boiled, and the other ſtewed till they are black. Indeed, excepting theſe, their animal food is eaten almoſt raw.

In times of ſcarcity many of the hill people ſubſiſt on the *Kebul*, which in growth is ſaid to be like the *Palmira*; and the interior part of the *trunk*, when pounded and

and ſteeped in water, is an article of food, in ſo much as to be the common means of ſuſtenance during a ſcarcity of grain. When boiled it is of a gelatinous ſubſtance, and taſtes, when freſh, like a ſugar cane: thoſe, who can afford it, mix rice with it. They alſo ſubſiſt on the *Kutchu*, a ſort of *Yam*, found in great plenty about the hills. I ſaw three ſorts, though I could not learn they had any ſeparate name. One has a number of buds on it, is ſaid to be a cooling medicine, and is eaten boiled or baked. Some of them I brought with me from the hills, and being bruiſed in the baſket uſed in bringing them from the hills, I cut off the rotten part, which I found to be of no detriment to their growth, although out of the ground. At *Dacca* I gave them to Mr. RICHARD JOHNSON, who, I underſtand, delivered them to Colonel KYD, the ſuperintendant of the Company's botanical garden, where, I hear, they have produced a very handſome flower. This plant was cultivated by the *Garrows*, nearly in the ſame manner as we do potatoes in *England*; a bud being broken off to be ſown for a plant. The *Garrows* ſay it yields, after it is dug out of the ground, and laid by for the enſuing ſeaſon of cultivation (commencing immediately on the breaking up of the rains) from three to ten buds. Another ſort of *Kutchu* grows at the tops of the hills, and is found by its ſprout, which twiſts itſelf round the trunk and branches of trees. I have ſeen the ſprout from ten to twenty feet high, the leaves have three ſegments like a vine leaf, but more pointed: of deep green, and very ſmall. The root is found from a foot to two feet and a half below the ground, is in ſhape tapering, of a reddiſh colour, and in length from five inches to a foot and half: it is eaten roaſted. The other ſpecies grows in the ſame manner, but is of a dirty yellow colour.

The houſes of theſe *Garrows*, called *Chaungs*, are raiſed on piles, about three or four feet from the ground, from thirty to 150 feet in length; and in breadth from ten to forty, and are roofed with thatch. The props of the *Chaung* conſiſt of large *ſaul* timbers: in the centre there are eight, and on the ſides from eight to thirty: over theſe are placed horizontally large timbers, for a ſupport to the roof, and tied faſt, ſometimes with ſtrings; but ſtring is rarely uſed for this purpoſe; the tying work being moſtly done with ſlips of graſs or cane. The roof is neatly executed, and with as much regularity as any of our Bungalow thatches. When I ſay this, however, I ſpeak of the *Chaungs* of the *Booneahs*: I went into few of the *Chaungs* of the lower claſs. The roof conſiſts of mats and ſtrong graſs. The ſides of the houſe are made from the ſmall hollow bamboos cut open, flatted, and woven as the common mats are. The floor is made in the ſame manner; but of a ſtronger

bamboo.

bamboo. The *Chaung* conſiſts of two apartments, one floored and raiſed on piles as deſcribed, and the other without a floor, at one end, for their cattle: at the other end is an open platform, where the women ſit and work. On one ſide alſo is a ſmall raiſed platform, uſually about ſix feet ſquare, incloſed at the ſides and open above: here the children play: in the centre of the *Chaung* they cook their victuals, a ſpace of about five feet ſquare being covered with earth; on one ſide a little trap door is made in the floor, for the convenience of the women on certain occaſions, which creates much filth under their *Chaungs*. Indeed a great part of their dirt is thrown under the *Chaung*, and the only ſcavengers I ſaw, were their hogs; but luckily for them, they have plenty of thoſe animals.

Bugs cover their wearing apparel, of the ſame ſort, as thoſe which infeſt beds in England: during my journey along the hills I ſuffered very much from them.

The diſpoſition of a *Garrow* could not be accurately known in the ſhort time I had to obſerve it; yet my intercourſe with them, which was of the moſt open nature, will, I think, allow me to ſay ſomething of it.

Their ſurly looks ſeem to indicate ill temper, but this is far from being the caſe, as they are of a mild diſpoſition. They are, moreover, honeſt in their dealings, and ſure to perform what they promiſe. When in liquor they are merry to the higheſt pitch: then men, women, and children will dance, till they can ſcarce ſtand. Their manner of dancing is as follows: twenty or thirty men of a row ſtanding behind one another, hold each other by the ſides of their belts, and then go round in a circle hopping on one foot, then on the other, ſinging and keeping time with their muſic, which is animating, though harſh and inharmonious, conſiſting chiefly of tomtoms, and braſs pans, the firſt generally beaten by the old people, and the laſt by the children. The women dance in rows and hop in the ſame manner, but hold their hands out, lowering one hand and raiſing the other at the ſame time, as the muſic beats, and occaſionally turning round with great rapidity. The men alſo exhibit military exerciſes with the ſword and ſhield, which they uſe with grace and great activity. Their dancing at their feſtivals laſts two or three days, during which time they drink and feaſt to an exceſs, inſomuch that it requires a day or two afterwards to make them perfectly ſober again, yet during this fit of feſtivity and drunkenneſs they never quarrel.

Marriage is in general ſettled amongſt the parties themſelves, though ſometimes by their parents: if it has been ſettled by the parties themſelves, and the parents of either refuſe their aſſent, the friends of the oppoſite party, and even others unconnected,

nected, go and by force compel the diſſenters to comply; it being a rule among the *Garrows* to aſſiſt thoſe that want their help, on theſe occaſions, let the diſparity of age or rank be ever ſo great. If the parents do not accede to the wiſh of their child, they are well beaten till they acquieſce in the marriage, which being done, a day is fixed for the ſettlement of the contract, or rather for a complimentary viſit from the bride to the bridegroom, to ſettle the day of marriage, and the articles, of which the feaſt ſhall conſiſt, as well as the company to be invited; and they then make merry for the night. The invitations on theſe occaſions are made by the head man of a *Chaung* ſending a *paun* to the inhabitants of another *Chaung*, as they cannot invite one out of a *Chaung* without the reſt: the man who carries the *paun*, ſtates the purpoſe for which it is ſent, and the next day an anſwer is made, if the invitation be accepted, but not otherwiſe, as they never wiſh to give a verbal refuſal; and, therefore, if no body returns the next day, the invitation is underſtood to be refuſed.

On the nuptial day, the parties invited go to the bride's houſe; it being the cuſtom among the *Garrows* for the bride to fetch the bridegroom: when the wine, &c. are ready, and all the company arrived, they begin ſinging and dancing, and now and then take a merry cup; while a party of the women carry the bride to the river, waſh her, and on their return home, dreſs her out in her beſt ornaments; this completed, it is notified to the company, and the muſic ceaſes: then a party take up the wine, proviſions, drums, pans, and a cock and hen, and carry them to the bridegroom's houſe in proceſſion; the cock and hen being carried by the prieſt, after which, the bride follows, with a party of women, walking in the centre, till ſhe arrives at the bridegroom's houſe, where ſhe and her party ſeat themſelves in one corner of the *Chaung* near the door; the remaining viſitors then proceed to the bridegroom's houſe, and the men ſit at the further end of the room, oppoſite to the women; the men then again begin ſinging and dancing; the bridegroom is called for; but, as he retires to another *Chaung*, ſome ſearch is made for him, as if he were miſſing, and, as ſoon as they find him, they give a ſhout; they then carry him to the river, waſh him, return, and dreſs him in his war dreſs; which done, the women carry the bride to her own *Chaung*, where ſhe is put in the centre; and, notice of this being brought to the viſitors at the bridegroom's houſe, they take up the wine, &c. and prepare to go with the bridegroom, when his father, mother, and family, cry and howl in the moſt lamentable manner, and ſome force is uſed to ſeparate him from them. At laſt they depart, the bride's

father leading the way, and the company following one by one, the bridegroom in the centre. On entering the bride's *Chaung*, they make a general ſhout, and place the bridegroom on the bride's right-hand, and then ſing and dance for a time, till the prieſt proclaiming ſilence, all is quiet; and he goes before the bride and bridegroom, who are ſeated, and aſks ſome queſtions, to which the whole party anſwer *Nummah*, or *good* *; this continues a few minutes, after which, the cock and hen being brought, the prieſt takes hold of them by the wings, and holds them up to the company, aſking them ſome queſtions, to which they again reply *Nummah*; ſome grain is then brought, and thrown before the cock and hen, who being employed in picking it, the prieſt takes this opportunity to ſtrike them on the head with a ſtick, to appearance dead, and the whole company, after obſerving them a few ſeconds, calls out as before; a knife being then brought, the prieſt cuts the anus of the cock, and draws out the guts, and the company repeat *Nummah*, after which he performs the ſame operation on the hen, and the company give a ſhout, and again call out *Nummah*. They look on this part of the ceremony as very ominous; for ſhould any blood be ſpilt by the firſt blow, or the guts break, or any blood come out with the guts, it would be conſidered as an unlucky marriage. The ceremony being over, the bride and bridegroom, drinking, preſent the bowl to the company, and then they all feaſt and make merry.

I diſcovered theſe circumſtances of the marriage ceremony of the *Garrows*, from being preſent at the marriage of LUNGREE, youngeſt daughter of the chief OODASSY, ſeven years of age, and BUGLUN, twenty-three years old, the ſon of a common *Garrow*; and I may here obſerve, that this marriage, diſproportionate as to age and rank, is a very happy one for BUGLUN, as he will ſucceed to the *Booneahſhip* and eſtate; for among all the *Garrows*, the youngeſt daughter is always heireſs, and, if there be any other children, who were born before her, they would get nothing on the death of the *Booneah*: what is more ſtrange, if BUGLUN were to die, LUNGREE would marry one of his brothers; and, if all his brothers were dead, ſhe would then marry the father: and, if the father afterwards ſhould prove too old, ſhe would put him aſide, and take any one elſe, whom ſhe might chuſe.

The dead are kept four days, burnt on a pile of wood in a *Dingy* or ſmall boat, placed on the top of the pile, and the aſhes are put into a hole dug exactly where the fire was, covered with a ſmall thatch building, and ſurrounded with a railing:

* I ſuſpect the word to be *Namah* or *ſalutation* and *reverence*. J.

a lamp

a lamp is burnt within the building every night, for the ſpace of a month or more; the wearing apparel of the deceaſed is hung on poles fixed at each corner of the railing, which, after a certain time (from ſix weeks to two months) are broken, and then allowed to hang downwards till they fall to pieces: they burn their dead within ſix or eight yards of their *Chaungs*, and the ceremony is performed exactly at twelve o'clock at night; the pile is lighted by the neareſt relation: after this they feaſt, make merry, dance and ſing, and get drunk. This is, however, the ceremony to a common *Garrow*. If it be a perſon of rank, the pile is decorated with cloth and flowers, and a bullock ſacrificed on the occaſion, and the head of the bullock is alſo burnt with the corpſe: if it be an upper hill *Booneah*, of common rank, the head of one of his ſlaves would be cut off, and burnt with him; and if it happen to be one of the firſt rank *Booneahs*, a large body of his ſlaves ſally out of the hills, and ſeize a *Hindu*, whoſe head they cut off, and burn with their chief. The railed graves of *Booneahs* are decorated with images of animals placed near the graves, and the railing is often ornamented with freſh flowers.

Their religion appears to approximate to that of the *Hindus*: they worſhip MAHADE'VA; and at *Baunjaun*, a paſs in the hills, they worſhip the ſun and moon. To aſcertain which of the two they are to worſhip upon any particular occaſion, their prieſt takes a cup of water and ſome wheat: firſt calling the name of the ſun, he drops a grain into the water; if it ſinks, they are then to worſhip the ſun; ſhould it not ſink, they then would drop another grain in the name of the moon, and ſo on till one of the grains ſink. All religious ceremonies are preceded by a ſacrifice to their god of a bull, goat, hog, cock, or dog; in caſes of illneſs, they offer up a ſacrifice in proportion to the ſuppoſed fatality of the diſtemper, with which they are afflicted; as they imagine medicine will have no effect, unleſs the Deity interfere in their favour, and that a ſacrifice is requiſite to procure ſuch interpoſition.

The ſacrifice is made before an altar conſtructed as follows: two bamboos are erected, ſtripped of all their branches and leaves, except at the extremity of the main ſtem, which is left: a ſtick is fixed near the top of each, to which is tied, at each end, a double ſtring, reaching to two ſide bamboos, about two feet out of the ground, with the tops ſplit, ſo as to make a kind of crown; between the ſtrings are placed bits of ſticks of about a foot in height, at the diſtance of a foot from each other, or more, in proportion to the height of the bamboos. The croſs ſticks thus form a ſquare, with the perpendicular ſtrings, and in every other ſquare, croſs ſtrings are tied, beginning with the top ſquare: round the bamboos a ſpace of ſix

or

or eight feet ſquare is cleared, and covered with red earth; and in front, at the diſtance of about ſix or more feet, a ſquare of two feet is cleared, in the centre of which a ſmall pit is dug, and ſpread over with red earth; at ſome diſtance from the altar, on the ſide neareſt the hills, two ſplit bamboos are bent into an arch, with the ends in the ground, ſo as to form a covering; under this a ſmall mound is raiſed, and a little thatched building erected over it, open at the ſides, under which ſome boiled rice is placed. When thus much is prepared, the prieſt approaches the little pit, and the people aſſembled ſtand behind him. He then mutters ſomething to himſelf; when the animal, intended to be ſacrificed, is brought, and the head cut off by the prieſt over the pit, ſome holding the head by a rope, and others the body: if the head is not taken off at one blow, it is reckoned unlucky. The blood is collected in a pan, carried to the covered arch, with the head of the animal, and put by the ſide of the mound. A lighted lamp is then brought, and put near the animal's head, when the whole company bow to the ground, and a white cloth is drawn over the arch, it being ſuppoſed their god will then come, and take what he wants; a fire is alſo kept burning during the ceremony between the altar and arch. An hour after, the covering is taken off, the proviſions therein placed, with the animal, are dreſſed for the company, and they make merry.

When a large animal is to be ſacrificed, two ſtaves are put by the ſide of the pit, ſo as to place the animal's neck between them: a bamboo is tied under his neck to the ſtaves, to prevent his head from falling to the ground: he is then ſtretched out by ropes, fixed to his legs, and his head is ſevered by the ſtrongeſt man among them.

Their mode of ſwearing at *Ghoſegong* is very ſolemn: the oath is taken upon a ſtone, which they firſt ſalute, then with their hands joined and uplifted, their eyes ſtedfaſtly fixed to the hills, they call on MAHADE'VA in the moſt ſolemn manner, telling him to witneſs what they declare, and that he knows whether they ſpeak true or falſe. They then again touch the ſtone with all the appearance of the utmoſt fear, and bow their heads to it, calling again upon MAHADE'VA. They alſo, during their relation, look ſtedfaſtly to the hills, and keep their right hand on the ſtone. When the firſt perſon ſwore before me, the awe and reverence with which the man ſwore, forcibly ſtruck me; my *Moherrir* could hardly write, ſo much was he affected by the ſolemnity. In ſome of the hills they put a tiger's bone between their teeth, before they relate the ſubject to be depoſed; others take earth in their hand; and, on ſome occaſions, they ſwear with their weapons in their hands. I underſtand

ſtand their general belief to be, that their God reſides in the hills; and, though this belief may ſeem inconſiſtent with an awful idea of the divinity, theſe people appeared to ſtand in the utmoſt awe of their deity, from their fear of his puniſhing them for any miſconduct in their frequent excurſions to the hills.

Their puniſhments conſiſt moſtly in fines. The *Booneahs* decide on all complaints, except adultery, murder, and robbery, which are tried by a general aſſembly of the neighbouring chiefs, and are puniſhed with inſtant death. As the money collected by fines was appropriated to feaſting and drunkenneſs, I wiſhed to ſee if I could induce them to give over this mode of puniſhing; but they told me plainly, they would not allow me to interfere; yet, as I had been very kind to them, when a man was to be puniſhed with death, they would let me know.

When any thing particular is to be ſettled, they all aſſemble in their war-dreſs, which conſiſts of a blue cloth (covering part of the back and tied at the breaſt, where the four corners are made to meet), a ſhield, and a ſword; they ſit in a circle, the ſword fixed in the ground before them. Their reſolutions are put into immediate execution, if they relate to war; if to other matters, they feaſt, ſing, dance, and get drunk.

Their chiefs debate the ſubject of deliberation, and their wives on theſe occaſions have as much authority as the chiefs. This I had an opportunity of ſeeing, when I ſettled the revenue they had to pay, having told them they would be well protected from any oppreſſion while under me; and that no more ſhould be taken from them, than was finally ſettled: ſome of the chiefs wiſhed to pay an inadequate ſum, when MOMEE, wife to the principal chief, roſe, and ſpoke for ſome minutes, after which ſhe aſked me if I declared the truth to them, and on my replying in the affirmative, they agreed to the revenue I demanded: SUJANI, wife of another chief, then came to me, and told me I had heard what ſhe ſuffered from the oppreſſion of the *Zemindars*, and begged, with tears in her eyes, that I would get juſtice done to her. I made a particular inquiry into her complaint, and made the *Darogah* of the paſs reſtore her cattle; and ſo much confidence had they at laſt in me, that they requeſted I would make a fair diviſion of their lands, which they would never ſuffer the *Zemindar* or his people to do.

Their mode of ſettling their proportions of payments, &c. is by ſticks: each of the inferior *Garrows* places as many ſticks in a pan, as he can give of the article required: the whole are then counted, and the deficiencies made up by the *Booneahs*: all their accounts alſo are kept by ſticks, as well as their agreements.

I have

I have before ſaid, on occaſions of illneſs, a ſacrifice is made to the deity: I endeavoured to find out what medicines they uſe, but I cannot ſay I have been ſucceſsful in this material point: I imagine, however, they muſt have ſome valuable plants, from the many great cures that appear to have been effected in wounds. The *neem* leaf ſeems to be much uſed in inflammations, and blue vitriol is applied to freſh wounds: this laſt medicine appears to have been introduced by the natives of *Bengal*; charms and ſpells are common among the *Garrows*. The tiger's noſe ſtrung round a woman's neck, is conſidered as a great preſervative in child-birth: they aver, it keeps off giddineſs and other diſorders conſequent on this event. A woman, for nearly a month before her time, is not permitted to ſtir out of her *Chaung:* ſix days after delivery ſhe and her child are carried to the river and bathed.

The ſkin of the ſnake, called the *Burrawar*, is eſteemed a cure for external pains, when applied to the parts affected.

Inoculation is common among the *Garrows*, but this appears to have been only of late years, and was introduced among them by JOYNARAIN *Zemindár* of *Sheerpour*, through the interference and recommendation of ſome of the hill traders, who, having been in the hills at a time when the *Garrows* were afflicted with this fatal diſorder, and dying without being able to aſſiſt themſelves, perſuaded the chiefs to ſend a deputation to the *Zemindár*, and he ſent them his family doctor, who is repreſented to have been very capable, and, by his ſkill, introduced inoculation among the *Garrows*; and this induced them to provide themſelves yearly with an inoculator, whom they reward in the moſt liberal manner, and take as much care of, while he reſides among them, as if he were their father. The inoculator is obliged to obtain from the *Zemindár* a *ſunnud*, permitting him to go into the hills, and for which he pays a very handſome fee; but the *Zemindár* is very cautious whom he permits to go into the hills to officiate on theſe occaſions.

Among the *Garrows* a madneſs exiſts, which they call tranſformation into a tiger, from the perſon who is afflicted with this malady walking about like that animal, ſhunning all ſociety. It is ſaid, that on their being firſt ſeized with this complaint, they tear their hair and the rings from their ears, with ſuch force as to break the lobe. It is ſuppoſed to be occaſioned by medicine applied to the forehead; but I endeavoured to procure ſome of the medicine, thus uſed, without effect: I imagine it rather to be created by frequent intoxications, as the malady goes off in the courſe of a week or a fortnight; during the time the perſon is in this ſtate, it is with the utmoſt difficulty he is made to eat or drink. I queſtioned a man, who had thus been afflicted,

afflicted, as to the manner of his being ſeized, and he told me he only felt a giddineſs without any pain, and that afterwards he did not know what happened to him.

The language of the *Garrows* is a little mixed with the *Bengáli*: a few words of it I annex; I had made a tolerable collection for a vocabulary, but unfortunately I loſt it, by one of my boats ſinking in the *Berhampooter*.

To drink,	ring,bo.
eat,	cha,ſuch.
bathe,	ha,boo,ah.
waſh,	ſu,ſuck.
fight,	den,juck.
wound,	ma,juck.
come,	ra,ba,ſuck.
go,	ree.
call,	gum,ma.
ſleep,	ſee,ſuck.
run,	ca,tan,juck.
bring,	rap,pa.
ſit,	a,jen,juck.
a man,	mun,die.
a woman,	mee,che,da,rung.
a child,	dooĕĕ.
head,	ſee,kook.
face,	moo,kam.
noſe,	ging.
mouth,	chu,chul.
eye,	mok,roon.
ear,	ner,chil.
hair,	ke,nil.
hand,	jauck.
finger,	jauck,ſee.
back,	bick,ma.
foot,	ja,chuck.
fire,	waul.

water,

water,	chee.
houſe,	nuck.
tree,	ber.
rice,	my,run.
cotton,	caule.
hog,	wauck.
cow,	ma,ſhu.
wine,	pa,ta,ka.
ſalt,	ſoom.
cloth,	ba,ra.
dog,	aa,chuck.
plenty,	gun,mauck.
good,	num,mah.
ſword,	dig,ree.
ſhield,	too,pee.
graſs,	cau,pun.

At the foot of the hills reſide a caſt of people called *Hajins*; their cuſtoms nearly reſemble the *Garrows*; in religious matters they partake more of the *Hindus*, as they will not kill a cow: their habitations are built like the houſes of the ryotts in general, but are better made, encloſed with a court-yard, kept remarkably neat and clean, the railing made of bamboos ſplit, flatted, and joined together; the ſtreets of their villages equal the neatneſs of their houſes. The men are of a dark complexion, well made and ſtout; their face nearly reſembles the *Garrow*, though rather of a milder look; their dreſs is the ſame as that of the head peaſants in *Bengal*, conſiſting of a *Dootee*, *Egpautah*, and *Pugree*, or waiſt-cloth, mantle, and turband.

The women are remarkably neat and clean: their dreſs conſiſts of one cloth, made to go near twice round the body, and to hang in folds, down to the ankle, covers their breaſts, and paſſes under their arms, and the ends are tucked in as the waiſt-cloth of the natives of *Bengal*: their hair is tied on the crown, and they have ear-rings in the ſame manner as the *Garrow* women, but no neck ornament.

This is the ſum of the obſervations, which my ſhort ſtay with the inhabitants of the *Garrow* hills enabled me to make on their manners and cuſtoms. I have written ſeparately an account of my journey at the foot of the hills to the different paſſes,

paſſes, where their trade is carried on, from which ſome further information may be derived of their conduct and character; but I am conſcious that my remarks deſcribe them but imperfectly, and found my only hope of their proving acceptable on the people, to whom they relate, having hitherto been wholly unnoticed: they may alſo perhaps lead to more accurate inquiries hereafter.

TO THE PRESIDENT.

DEAR SIR,

I NOW have the pleaſure to incloſe a copy, written with a ſtylus on five palmyra-leaves, of the engraving on copper-plates preſerved in the great pagoda of *Conjeveram*; the language is the *Dévavánì*, and the character *Dévanágarì*. Two perſons only at this place can read and expound them: they contain an account of the diviſion of lands, &c. in this country. Thus have I taken the liberty to trouble you with matters which may, or may not, prove of conſequence; they who are able to judge of them muſt determine. Should any good ariſe from theſe communications, my merit will be only that of the ſlave, who digs from a mine the rough diamond, which others, of ſuperior ſkill and capacity, cut and poliſh into its full luſtre and value.

I am, dear Sir,

Your moſt obedient humble ſervant,

ALEXANDER MACLEOD.

Conjeveram, April 7, 1791.

III.

A ROYAL GRANT OF LAND IN CARNATA.

Communicated by ALEXANDER MACLEOD, *Esq. and tranſlated from the Sanſcrit by the Preſident.*

Proſperity attend you!
Adoration to GANE'SA!

STANZAS.

1. ADORED be the God SAMBHU, on whom the city of the three worlds reſted in the beginning as on its main pillar, and whoſe lofty head is adorned with a creſcent, that kiſſes it, reſembling the point of a waving *Chámara!*

NOTE.

The compariſon is taken from the image of an *Indian* prince, fanned by an officer, who ſtands behind him, with the tail of a *Chamara*, or wild cow, the hairs of which are exquiſitely fine, and of a pale yellow tint. SAMBHU is MAHA'DEVA.

2. May the tuſk of that boar, whoſe form was aſſumed in ſport by HERI, when the raiſed earth was his gorgeous umbrella with *Hémádri* (or the *golden mountain*) for the ornament of its top, be a ſtaff to keep you ſecure!

NOTE.

VISHNU, in his *third* incarnation, is allegorically repreſented as a boar, the ſymbol of ſtrength, ſupporting our globe on his tuſk, which is here compared to the ſtaff of a *Ch'hatra*, or *Indian* umbrella. The *Ch'hatras* of rich men have an ornament of gold on their ſummits, called a *Calaſa*, to which the royal bard, who wrote the grant, compares the mountain *Suméru*, or the North-pole.

3. May the luminous body of that God, who, though formed like an elephant, was born of PA'RVATI, and is revered even by HERI, propitiouſly diſpel the gloom of misfortune!

NOTE.

The bodies of the *Hindu* gods are ſuppoſed to be an *ethereal ſubſtance* reſembling light; and GANE'SA, or the Divine Wiſdom perſonified, is repreſented with the head of an *elephant*: his mother was the daughter of the mountain *Himálaya*. This couplet is in the ſtyle called *yamaca*, where ſome of the words have different meanings, but are applicable, in all of them, to the reſt of the ſentence: thus *Agajà*, or *mountain-born*, may ſignify the goddeſs PA'RVATI; but it alſo means *not a female elephant*; and HERI, or VISHNU, may be tranſlated a *lion*, of which elephants are the natural prey.

4. There

To face p. 398.

and

4. There is a luminary, which roſe, like freſh butter, from the ocean of milk churned by the gods, and ſcattered the gloom from around it.

NOTE.

After the uſual ſtanzas, called *mangala*, or *auſpicious*, we are preſented with the pedigree of the donor, beginning with the Moon, who, in the *ſecond* incarnation of VISHNU, was produced from the ſea of milk. A compariſon of the moon to *butter* muſt ſeem ridiculous to *Europeans*; but they ſhould conſider, that every thing, which the *cow* produces, is held ſacred by the *Hindus*; and the ſimile is conſiſtent with the allegory of a *milky* ocean *churned* by the deities.

5. The offſpring of that luminary was BUDHA, or the Wiſe, with reaſon ſo named from his unequalled acts of devotion and eminent virtues: the ſon of BUDHA was PURU'RAVAS, by the force of whoſe arm the lives of his foes were deſtroyed: his ſon was A'YUS; his, NAHUSHA; his, the hero YAYA'TI, famed through the world in battle; and from him, by his happy conſort DE'VAYA'NI', came TU'RVASU, equal to a God.

NOTE.

This pedigree is conformable to the *Puránas*. BUDHA was probably an old philoſopher and legiſlator, highly revered, while he lived, and ſuppoſed after his death to preſide over the planet MERCURY; while his father (if that be not an aſtronomical fable) was conceived to be regent of the Moon: he gives his name, like the WODEN of the north, to the *fourth* day of the week. The original epithet of the laſt king, named in this verſe, is *Vaſunibha*, or *equal to a Vaſu*; but the jingle of ſyllables, which the *Indian* poet meant as a beauty, is avoided in the tranſlation. A *Vaſu* is one of the *eight* divinities, who form a *gana*, or aſſemblage, of Gods; and there are *nine* of thoſe *ganas*.

6. In his family was born DE'VACI'JA'NI; and in his, TIMMA, a ſovereign celebrated among thoſe of equal deſcent, like VRĬSHNI among the children of YADU.

NOTE.

If *Tulavínda* be the true reading in the ſecond hemiſtich, it muſt be the name of a kingdom: but we muſt beware of geographical errors, leſt the names of countries, which never exiſted, ſhould find their way into maps. YADU was another ſon of YAYA'TI; and CRISHNA deſcended from him through VRISHNI, whence the Shepherd God is named *Yádava*, and *Várſhnéya*.

7. From him ſprang BHUCCAMA'JA'NI, a ruler, who cheriſhed the world; a gem on the head of kings, not ſpreading terror around, but gleaming with undiminiſhed brightneſs.

8. He lived with delight; and DE'VACI'NANDANA, the king who gave felicity to mankind, ſprang from him, like the God of Love from the ſon of DE'VACI.

NOTE.

CA'MADE'VA, or the God of Love, was born in one of his incarnations as the ſon of CRISHNA, whoſe real parents were DE'VACI' and VASUDE'VA: in that birth CA'MA took the name of PRADYUMNA, and was

father

father of ANIRUDDHA, whoſe adventures with USHA' are the ſubject of a beautiful tale and a very intereſting drama.

9. In many places, of which *Rámeſwara* was the firſt, renowned for various exertions of virtue, he diſtributed, as the law ordains, with a joyful heart again and again, a variety of gifts around the ſhrines of the deities; attaining ſuch fame on earth, that the inhabitants of the three worlds expanded it in triumphant ſongs.

NOTE.

Rámeſwara near the ſouthern extremity of the *Indian* continent, received its name and ſanctity from the *ſeventh* incarnation of VISHNU in the form of RA'MA. This *ninth* couplet is written in a ſingular metre, with rhimes in the middle of each diviſion:

Vividha ſucritód *dámé rámé* ſwara pramuc'hé muhur,
Muditahridaya *ſt'hánè ſt'hánè* vyadhatta yat'há vidhi
Vibudhaperitó *nánà dánà* niyah bhuvi ſhodáſa,
Tribhuvanajanód *gítam ſp'hítam* yaſah punaruddhayan.

If *ſnánè* be the correct reading, it means a ſacred bathing-place; and if *ſhódaſa* be properly written at the end of the third line, it may imply, that the royal donations were made to *ſixteen* temples; or that the principal donations were *ſixteen*.

10. He ſhone forth conſpicuouſly, having rapidly bound the *Cávérì*, by raiſing a bridge over that receptacle of tumultuous waters; and having, by the ſtrength of his arm, made JI'VAGRA'HA captive in battle, he appointed that kingdom, of which the name begins with *Sríranga*, as the feudal territory of his priſoner, but ſubject to his own dominion paramount: he was praiſed, even to the end of his career, by the three peopled worlds, who heard the whole extent of his fame.

NOTE.

JI'VAGRAHA ſeems to be the proper name of a prince, whoſe dominions lay beyond the *Cávérì*: the word means the *Seizer of Life*. Among the many epithets of the god SIVA we find RANGA; and *Sríranga pattan*, or a city dedicated to him, is the capital of *Mahéſwar*, ſo called from another name of the deity. Thoſe appellations are in ſome meaſure preſerved to this day; but the ancient name of *Travancore* was *Mallára*.

11. Having conquered the regions of *Chéra*, *Chóla*, and *Pánjya*, ſubdued the king MADHURIVALLABHA, whoſe chief ornament was his loftineſs of mind, taken VI'RYO'DAGRA priſoner, vanquiſhed the king GAJAPETI, or Lord of Elephants, and other ſovereigns, he became univerſally celebrated from the northern banks of *Gangà* to *Lancà* (the equinoctial point) from the verge of the firſt, or eaſtern, to that of the laſt, or weſtern, mountain, and placed his awful beheſt, like a chaplet of flowers, over the heads of the mightieſt potentates.

NOTE.

NOTE.

Two *Bráhmens*, who perused this couplet, proposed to read *Páudya*, of which they had before heard, instead of *Pánjya*, which appears in the transcript. Had *Madhurá* been written instead of *Madhurí*, there could have been little doubt, that it meant one of the southern kingdoms: one of my *Pandits* thinks, that it means *Madura*.

12. From that chief of lion-like men, by two queens TIPWA'JI' and NAGARA', as from DASARAT'HA by the divine CAUSALYA' and SUMITRA',

13. Sprang two valiant, yet modest, heroes, like the two princes RAMA and LACSHMANA, named VIRANRISINHENDRA and CRISHNARAYA, both lords of the earth.

14. The famed VIRANRISINHA, having taken his seat in *Vijayanagar*, on a throne blazing with gems, far surpassed in glory and policy the ancient kings NRIGA, NALA, NAHUSHA, and, consequently, all other monarchs on earth: from the southern bridge to *Sumeru*, the mountain beautifully extended on this globe, and from the eastern, to the fartherst extremity of the western, hills, he dwelled in the hearts of mankind, and governed his realms with mild sway.

NOTE.

All the kings, named in the three preceding stanzas, are celebrated in the heroick poems of *India*; and *Vijayanagar*, or the *City of Conquest*, is very generally known. The epithet *avanisutanutah*, which, if it be the *fifth* case, agrees with *Sumeru*, may agree, in the *first* case, with the hero, and signify *applauded by the son of the earth*, that is by MANGALA, or the planet MARS, who gives his name to the *third* day of the *Indian* and *Gothick* weeks. TRIVEDI SERVO'RU contends, that it means, *praised by the sons of the earth, or by all men born on it*.

15. He offered many presents in the Golden Court, in the temple of the three-eyed God, in the city of him, whom CA'LAHASTI' owns as her lord, on the mountain *Vencata*, in *Cánchì*, on the two mountains of *Srì* and *Sóna*, in the great shrine of HERIHERA, at *Ságarasangama*, *Sríranga*, *Cumbhacóna*, *Niverti*, and *Mahánandi*, that place of pilgrimage, by which the gloom of sin is dispelled.

16. At *Gócarna*, at RA'MA's bridge, and in numberless places famed in this world for their virtue, the waters of the sea were dried by the dust scattered from the hoofs of his galloping steeds, and the earth herself was oppressed and disturbed by the God, who grasps the thunder bolt, and who felt pain from the obstruction of the ocean, until multiplied force was restored to the world by the abundant streams of his immense liberality.

NOTE.

The holy places, enumerated in these two stanzas, are all well known to the *Pandits*, except *Niverti*: the correctness of the reading may, therefore, be suspected. *Hábala*, which my *Nágarì* writer pronounces to be

be *the name of a river*, and which one of my three *Pandits* knows to be a place of pilgrimage, appears on the palm-leaf; but *Ságara* is written above it. If two diſtinct places are intended, we find *ſixteen* in all, agreeably to the *ninth* ſtanza. The firſt meridian of the *Hindus* paſſes through the city of *Ujjayini*; of which we know the poſition; but, as *Lancà*, therefore, falls to the weſt of *Sílán*, which RA'MA's bridge ſeems to mark as the kingdom of RA'VAN, the *Indians* believe that the iſland had formerly a much larger extent; and it has been aſſerted, that appearances between *Sílán* and the *Maldives* in ſome degree juſtify that belief. *Maldive* is, moſt probably, a corruption of *Malayadwípa*, from the promontory of *Malaya* on the continent of *India*.

In the following verſes, which I received from a venerable aſtronomer, *Cánchì* alſo appears in the firſt meridian, and *Ujjayinì* ſeems diſtinct from *Abantì*, though ſome authors inſiſt, that they are one and the ſame city.

Bhúmedhya rêc'há canacádrilancá
medhyaſt'hadéſáh cila vatſagulmau,
Cánchí, ſarah ſannihitam, curúnám
cſhétram tat'há pajjanicápyabantí,
Sitáchalaſchójjayiní che déva
canyá che róhítaca gargarátau.

"The places in the meridian line between the *golden mount*, and *Lancá*, are *Vatſa*, *Gulma*, *Cánchi*, *Sannihitaſarah*, *Curucſhétra*, *Paſſanicà*, *Abantì*, *Sítáchala*, *Ujjayinì*, *Dévacanyá*, *Róhítaca*, *Gargarát*."

17. The gifts, which he ſpread around were; 1. A *Brahmánda*, or Mundane Egg; 2. A Circle of the Univerſe; 3. A Vaſe repreſenting the five Elements; 4. A Cow formed of Gems; 5. A Figure of the ſeven Seas; 6. Two Sprigs from the Tree of Ages; 7. A golden CA'MADHE'NU, or celeſtial Cow; 8. A Terreſtrial Sphere made of Gold; 9. A Chariot and Horſes of the precious Metals; 10. A Man's Weight of Gold; 11. A thouſand Images of Cows; 12. A golden Horſe; 13. An Image of BRAHMA; 14. A golden Car; 15. A Plough of Gold, complete in its five Parts; 16. A Car drawn by Elephants of the ſame Metal.

NOTE.

If all this be not a wild poetical exaggeration, and if ſuch preſents were often made by the *Hindu* princes, the *Moghols*, who ſoon after conquered moſt of the ſouthern provinces, muſt have plundered the *Hindu* temples of immenſe treaſures.

18. He was eminently wiſe, and ruled with undiminiſhed magnificence; and, when he aſcended, with the cordial acquieſcence of INDRA, to a celeſtial manſion, leaving behind him the reputation of a king, who reſembled in his great qualities that ruler of the firmament.

19. Then the king CRISHNARA'YA, with irreſiſtible power, bore the round earth on his arm like a bracelet of gems.

NOTE.

NOTE.

This prince, the donor of the land, was probably the younger brother of VI'RANRISINHA, who died, it ſeems, without male iſſue.

20. The Gods had apprehenſions, in the beginning of time, that the glory of ſo great a monarch would rapidly diffuſe one vaſt blaze over the univerſe, and leave them without marks of diſtinction: thence it was, that PURA'RI aſſumed a third eye in his forehead; PEDMA'CSHA, four arms; ATMABHU', four faces; that CA'LI' held a cimeter in her hand; RAMA', a lotos-flower; and VA'NI', a lyre.

NOTE.

The ſix names in the text are appellations of the Gods MAHA'DE'VA, VISHNU, BRAHMA', and the Goddeſſes DURGA', LACSHMI', SERESWATI': they ſignify, in order as they occur, the foe of *Pura* or *Tripura*, the Lotus-eyed, the Self-exiſting, Female Time, the Delightful, and Speech.

21. In the midſt of his aſſembled foes, he darts a conſuming fire kindled by his wrath. Oh! what ſaid I? He dries up the ſeries of ſeven oceans with the duſt and ſand of the whole earth trampled on by the cavalry of his numerous armies, and preſently forms a new range of ſeas, blazing with his meaſureleſs glory, by the unbounded ſtreams of thoſe noble gifts, among which the firſt were a Mundane Egg and a golden figure of *Meru*.

22. "May you long enjoy entire here below the felicity and wealth beſtowed "on you by me!" Thus bleſſing mankind, and well knowing the general obſtacles to an aſcent in the car of the ſun towards the manſion of the gods, he diſtributed in all regions of the world thoſe obeliſks, which confer celebrity, and on which encomiaſtick verſes are engraven by the Goddeſs of Abundance herſelf, that they might become the laſhes of whips to quicken the horſes of the mountains.

NOTE.

The extravagant imagery in this couplet is connected with the old *Indian* cuſtom of raiſing pillars to perpetuate the memory of great events, and with the belief of the *Hindus*, that the ſouls of good men paſs *through the ſun* to their ſeat of happineſs. Although the *Columns of Victory*, as they are called, were monuments of kingly pride or of courtly adulation, yet the poet inſinuates, that the donor intended to facilitate a paſſage to heaven for thoſe whom he had enriched on earth; and the mountains are animated, to become the horſes of the ſun's car, and to be laſhed by the royal obeliſks.

Other columns were erected, perhaps, as *Gnomons*, and others, poſſibly, to repreſent the phallus of ISWARA; but thoſe called *Jayaſtambhas*, or *Pillars of Victory*, ſome of which remain to this day with metrical inſcriptions, are moſt frequently mentioned by the ancient poets of *India*.

23. He proceeded continually, as the law preſcribes, for the attainment of greatneſs and proſperity, to all the terreſtrial ſeats of the Gods and places of pilgrimage, the firſt of which were *Cánchì*, *Sríſaila*, mount *Sóna*, *Canacaſabhà*, or the Golden Court,

Court, and *Véncatádri*; where he diſpenſed many offerings, as a man's weight of gold, and the like, together with all the ſmaller oblations, which are ſpecified in the *Agama*.

NOTE.

The *Agáma* is a myſterious book, or ſet of books, part of which has been communicated to me by a *Sannyási* of *Mat'hurà*: it is ſo named, becauſe it is believed to have *come* from the mouth of SIVA, as the *Vedas* proceeded ſeverally from the four mouths of BRAHMA'. The ſame word means alſo the *Véda*.

24. When he is enraged, he becomes a rod to puniſh guilty ſovereigns: when he aſſumes the arm of SE'SHA, he acts as the chief preſerver of this globe: he ſmiles with a placid cheek, when juſt princes addreſs him; but rages in battle, when he relieves oppreſſed nations who aſk his protection.

NOTE.

SE'SHA is the king of Serpents, the couch of VISHNU, and the ſymbol of Eternity. The meaſure of this rhimed couplet is dactylick, and each of its four diviſions begins and ends with a ſimilar ſound; as,

Róſha critah pretipárt'hiva *danda*
Tóſha cridart'hiſhu yò rana *chanda*.

25. Juſtly is he ſtyled *Rájádhirája*, ſince he is the ſupreme ruler of rulers, offering a mild cheek to the princes of *Múru*, but filling other kings with terror.

NOTE.

The phraſe *ráyaraganda* occurs both in this and in the preceding ſtanza. *Ráya* means a king, not in *Sanſcrit*, but in a popular idiom; and the whole phraſe may be a title in the vulgar dialect of *Carnâta*. It is here preceded by *Múru*, which we ſhall find again towards the end of the grant, and which may, or may not, be the name of a country. Not one of the three *Pandits*, who were conſulted on the meaning of the words *Múru* and *Raganda*, could throw any light on them; except that *Múru* is a territory, of which the derivative is *Maurava*.

26. He is a deliverer of thoſe *Hindu* princes, who act like beneficent genii, but a deſtroyer of thoſe who rage like fierce tigers: thence he receives due praiſes, with the title *Víraprataápa*, or the glory of heroes, and other ſplendid epithets.

NOTE.

The word *Hindu* is applied likewiſe in a verſe of CA'LIDA'S to the original inhabitants of this country; but the *Pandits* inſiſt, that it is not *Sanſcrit*. Since the firſt letter of it appears to be radical, it cannot be derived from *Indu*, or the moon; but, ſince a ſibilant is often changed into an aſpirate, it has been thought a variation of *Sindhu* or *Indus*. To that etymology, however, we may object, that the laſt conſonant alſo muſt be changed, and that *Sindhu* is the name of a *river*, not of a *people*.

27. He is revered by the kings of *Anga*, *Benga*, *Calinga*, and others, who exclaim, "Look on us, mighty potentate! Live, and conquer!"

NOTE.

NOTE.

Anga was the ancient kingdom of *Carna*, including the diſtrict of *Bhágalapura*. To the eaſt of *Gaura*, or the *Land of Sugar*, to which we give the name of *Bengal*, lies *Benga*, properly ſo named. *Calinga*, a word known to the *Greeks*, is the country watered by the *Gódáverì*.

28. Exalted with praiſes by the wife, the king CRISHNARA'YA ſits on a throne of gems in *Vijayanagar*, ſurpaſſing in the practice of moral virtue NRIGA and other monarchs: from the centre of the eaſtern, to that of the weſtern, mountain, and from *Hémádri* to the ſouthern bridge, he ſhines with tranſcendent glory, diſpenſing riches and felicity through the world;

29. One thouſand four hundred and forty-eight years of the *Sacábda*, or era eſtabliſhed in memory of SA'LI'VA'HANA, being elapſed;

30. In the year *Vyaya*, in the month of *Puſhya*, when the ſun was entering *Macara*, in the dark fortnight, on the day of BHRIGU, and on that venerable *tit'hi*, the tenth of the moon;

31. Under the conſtellation *Viſác'há*, at a time productive of good fortune, on the banks of the river *Tungabhadrà*, near the temple of the God with three eyes.

NOTE.

The date of the grant follows the genealogy of the donor, and precedes that of the donee; after which comes a deſcription of the land granted, and the religious tenure by which it was to be held. The *Sacábda* began in Y. C. 78, and the grant was made in Y. C. 1526, the very year in which BABUR took poſſeſſion of *Dehli*; or 264 years ago: for, by the almanack of *Navadwipa*, the firſt of *Vaiſác'h* 1712 Y. S. anſwers to 11th *April* 1790 Y. C. The cycle of ſixty is divided into ſets of twenty years, each ſet being ſacred to one of the three divine attributes; and *Vyaya* is the 20th year of the cycle, or the laſt in the part allotted to BRAHMA'. *Macar* is the ſign of *Capricorn*, and *Puſhya*, the 8th lunar manſion. BHRIGU was the father of SUCRA, who preſides over the planet *Venus*, and is properly named BHA'RGAVA; but the day of BHRIGU means Friday.

32. That temple, where prieſts, who have aimed at piety towards ISWARA as their only grandeur, and who ſhine only with the fame of eminent holineſs, fix their heart on the godhead alone;

33. Him, who is an ornament of AGASTYA's race, and whoſe peculiar ſtudies are the *Sác'hás*, or branches, of the *Yajurvéda*; whoſe father was diſtinguiſhed on earth in this age of *Cali*, or contention, by the ſurname of RA'YA;

34. Born in the family of TAMVA, SRI' AILLAPA BHATTA, ſurnamed *Sánc'hyanáyaca*, or chief teacher of the *Sánchya* philoſophy (thus men openly declare his name, his race, and his virtue);

35. Him the king has appointed the diſpenſer of nectareous food even here below, to thoſe pious ſtudents, and, in like manner, his ſons and ſons' ſons to an age without end.

NOTE.

AGASTYA was an ancient ſage, now believed to preſide over the ſtar *Canopus*.

36. The land called *Srijayacunda* by the inhabitants of the diſtrict of *Chóla*, that named *Méyitcóta* in the principality of *Chandragiri*; that known in *Ambinári* by the name of *Malacà*.

NOTE.

The couplets, containing a deſcription of the land, are ſo indiſtinctly written, that the grammatical conſtruction of them can hardly be traced. The firſt letter of *Méyitcóta* may belong to the preceding word; and an entire hemiſtich ſeems in this place to be omitted.

It may here be remarked, that this whole grant is conformable to the rules of YA'GYAWALCYA, in whoſe work we find the following verſes:

Datwá bhúmin nibandhan và crítwà léc'hyantu cárayét,
ágámibhadrauripati perijnyánáya párt'hiwab;
Patévà támrapáttè và ſwamudróperichihnitan
abhiléc'hyátmanò vanſyánátmánanchemahípetih.
Pretigrahaperímánán dánach'hédópawernanan,
ſwabaſtacálaſampannan ſáſanan cárayétſ'hiran.

"Let a king, having given land, or aſſigned revenue, cauſe his gift to be written, for the information of "good princes, who will ſucceed him, either on prepared cloth, or on a plate of copper, ſealed above with "his own ſignet: having deſcribed his anceſtors and himſelf, the dimenſions or quantity of the gift, with "its metes and bounds, if it be land, and ſet his own hand to it, and ſpecified the time, let him render his "donation firm."

37. Land, ſituated to the eaſt of *Tirumápéru*, *Cájómaca*, and ſo forth, and the two villages *Cónáru* and *Cóbila*;

38. Placed to the ſouth of *Palapúruſha* and *Hulli*, and to the weſt of the town called *Parundar*;

39. To the north of *Bérupù* and *Purapácà*, including the town which has the name of *Sivabhactapura*, or that of SIVA's adorers;

40. With another propitious name derived from the four ſacred hearths *(Chaturvédi)* of the delightful *Chóla*; together with the charming town of *Góvindapári*;

41. Where

41. Where eleven *Bráhmens* are to water one *Amra* tree, and to worſhip the God RUDRA by day and by night after the preſcribed acts of devotion;

42. And the ſmaller town, called *Chattupácà*, ever abundant in grain, inhabited by men eminently learned, in the great principality of *Paravíru*.

43. A place to be honoured by all, marked on all ſides by four diſtinct boundaries; ſurrounded with rivulets formed by good genii, the pebbles of which are like gems carefully depoſited.

44. Viewed with delight by the diſtant eye, fit to be enjoyed by deities; graced with trees exquiſitely beautiful; having the advantage alſo of ponds, wells, and pools of water with raiſed banks;

45. Frequented by officiating prieſts and attendants, with ſubdued paſſions and benevolent hearts; by deities of different claſſes, and by travellers, who know the *Véda*, and converſe with copiouſneſs:

46. All the land before mentioned has the great prince GRISHNADE'VA, worthy of reverence from the wiſe, given with ſerene joy, having firſt diffuſed a ſtream of gold, ſilver, and gems.

47. Such was the decree of CRISHNARA'YA, to whom belongs the whole earth celebrated by the royal bards; that bountiful king, who is the ſource of all the wealth poſſeſſed by the bards of *Múru*.

48. By the command of the great *Ráya* CRISHNADE'VA, the preſident of his council proclaimed this donation to MRIRA, or ISWARA; and his command is here engraved on plates of copper.

49. The artiſt *Srí* VI'RANA'CHA'RYA, the ſon of MALLANA, wrote on copper this grant of the great prince CRISHNADE'VA.

50. As between a gift of land and the confirmation of it by the ſucceſſors of the donor, the confirmation is more meritorious than the gift; by the gift, a king attains a ſeat in heaven; by the confirmation, a ſeat from which he never can fall.

51. The confirmation of a gift by another prince has twice the merit of a gift by himſelf; but the reſumption of land granted by another makes even his own gift fruitleſs.

52. He who reſumes land given either by himſelf or by another, becomes a worm in ordure for ſucceſſive births through a period of ſixty thouſand years.

53. Land, granted for virtuous purpoſes, is in this world the only ſiſter of kings; and conſequently muſt not be enjoyed by them, nor taken by them in marriage.

54. "This

54. " This is the univerſal bridge of virtue for princes, and muſt be repaired by " you from time to time:" thus doth RA'MACHANDRA exhort again and again the ſovereigns of the earth, both thoſe who now live, and thoſe who are to reign hereafter.

SRI' VIRU'PA'CSHA!

OR,

THE GOD WITH THREE EYES!

IV.

ON THE MUSICAL MODES OF THE HINDUS. — *See the Works of Sir William Jones, Vol. I. p.* 413.

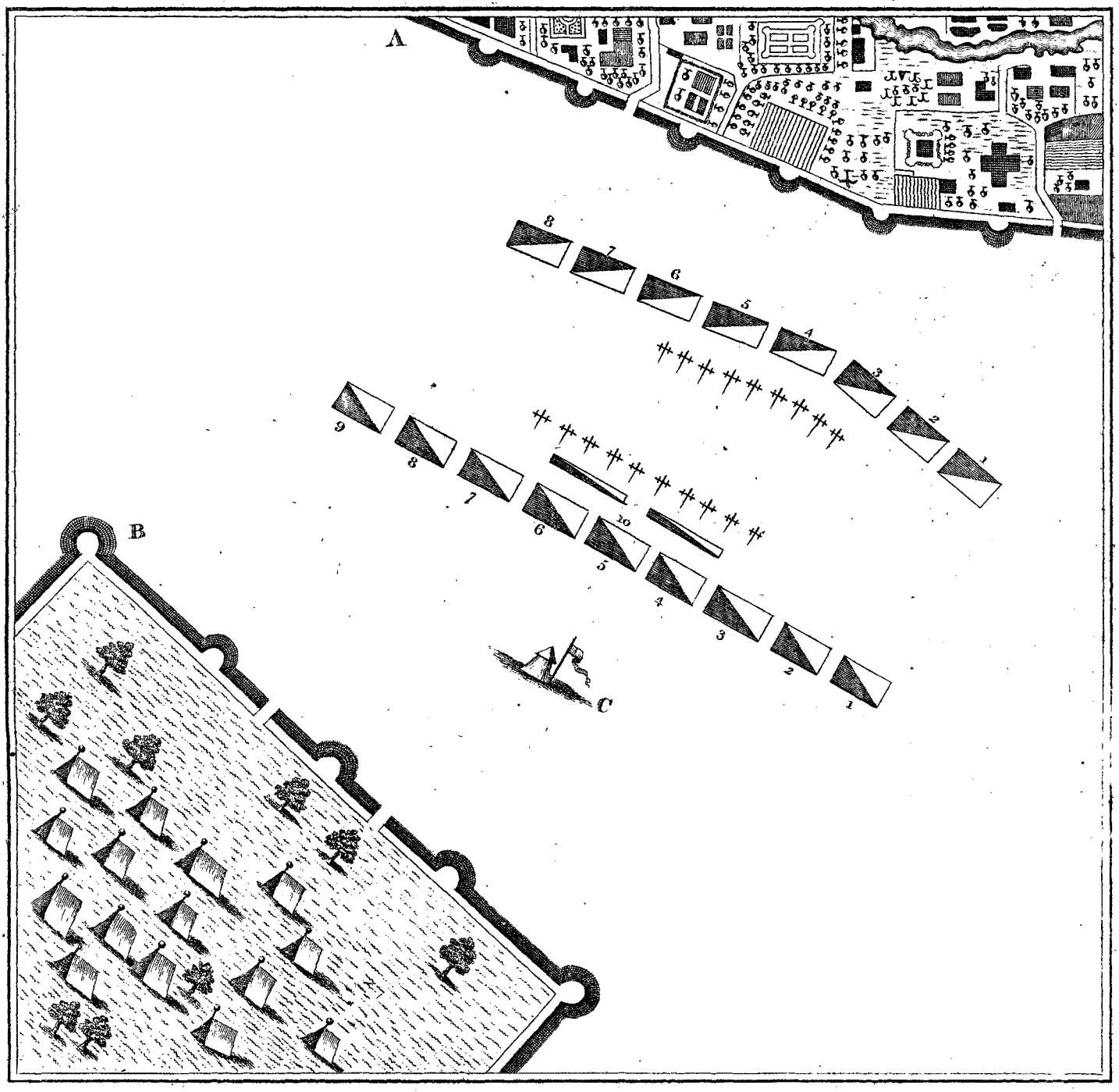
A LETTER FROM LIEUTENANT BROWNE TO THE PRESIDENT.

DEAR SIR,

IN the courſe of reading hiſtory, it is a reflection, which muſt, I think, have occurred to every one, that, if the actors in the moſt material events could have foreſeen the importance, which thoſe events would have in the eyes of poſterity, they would certainly have preſerved ſuch detailed and circumſtantial relations of them, as would have prevented the general darkneſs and uncertainty, which we now experience and lament: but it has probably ſeldom happened, that their genius, or leiſure from more important concerns, has admitted of this; and thus we are from neceſſity often compelled to reſt ſatisfied with imperfect traditions, repeated (or, which is worſe, arbitrarily amended) by ſubſequent hiſtorians.

With what avidity ſhould we now peruſe an account written by any of the principal perſons preſent at the battle of *Haſtings*, of *Lincoln*, of *Lewes*, of *Eveſham*, of *Creſſy*, of *Agincourt*, of *Towton*, or of *Boſworth!* but in thoſe days, a general or ſtateſman was as unſkilful with his pen, as he was expert with his ſword; and the monks, who were almoſt the only writers, were ſeldom participators of ſuch active ſcenes.

Conſidering



Plan of the Battle of Panipat.

Conſidering this, as well as the importance, which the wars and politicians of *Hindoſtan* have now acquired in the opinions of *European* hiſtorians, I cannot avoid believing, that the great events of this country will hereafter be ſought for with as much diligence as thoſe of the early part of *European* hiſtory are at preſent: if I am not miſtaken in this, the battle of *Paniput* will be among thoſe events, which will claim the greateſt attention, both as a military action, and as an era, from which the reduction of the *Mahratta* power may be fixed, who otherwiſe would probably have long ago reduced the whole of *Hindoſtan* to their obedience.

It appeared to me in this light at a time, when a very particular and authentick narrative of that action came into my poſſeſſion: and, as the plainneſs of the original led me to believe myſelf competent to the taſk, I was induced to undertake the tranſlating it into *Engliſh*, that the difficulty in reading it in the *Perſian* might not prevent its being as generally known as its hiſtorical importance merits.

It is almoſt ſuperfluous to tell you, dear Sir, who are ſo well verſed in *Aſiatick* hiſtory, that this battle was fought in the month of *January* 1761, between the united forces of all the *Mahratta* chiefs on one ſide, commanded by SEDASHEO, (commonly called the BHOW) and the combined armies of the *Durranies*, *Rohillas*, and *Hindoſtany Muſſulmans*, on the other, under the command of AHMED SHAH DURANNY: few battles have been more bloody, or deciſive of greater events; for, had the *Mahrattas* been conquerors, they would have put a final period to the *Muſſulman* dominion in *Hindoſtan*, and eſtabliſhed their own in its place; but, as it happened, the power of the *Mahrattas* received a ſhock, from which it has never entirely recovered; and the DURANNY SHAH, having returned precipitately to his own dominions, left the diſunited *Rohillas*, and *Hindoſtany Muſſulmans* to carry on, as they could, their diſtracted government, under a wretched pageant of royalty, and a divided and unprincipled nobility.

The writer of this narrative, CASI RAJ PUNDIT, was a *Muttaſeddy* in the ſervice of the late Vizier, SHUJA-UL-DOWLAH; and, being by birth a native of the *Decan*, acquainted with the *Mahratta* language, and having ſome friends in the ſervice of the BHOW, he became the channel of ſeveral overtures for peace, which the BHOW endeavoured to negociate through SHUJA-UL-DOWLAH: this, together with the accuracy and clearneſs of his narrative, makes it much more intereſting than any other which I have ſeen. The tranſlation is however far from literal, as I endeavoured to make the ſtyle as plain and unadorned as poſſible.

Such as it is, permit me, dear Sir, to offer it to you, and to leave it to your diſpoſal;

poſal: if I am ſo happy as to know, that it receives your approbation, as likely to prove uſeful in elucidating the hiſtory of this country, I ſhall think myſelf ſufficiently rewarded for the time it has taken up. Believe me to be, with the greateſt eſteem and reſpect,

Dear Sir,

Your very faithful
and obedient ſervant,
JAMES BROWNE.

Dinapore, February 1, 1791.

V.

AN ACCOUNT OF THE BATTLE OF PANIPUT,

AND OF THE EVENTS LEADING TO IT.

Written in Perſian by CA'SI RAJA PUNDIT, *who was preſent at the Battle.*

BALA ROW, *Pundit pradhán*, who ſat on the *Muſnud* of government in the *Decan*, was conſidered by the chiefs and inhabitants of *Hindoſtan* as a man of wiſdom, circumſpection, and good fortune: but he naturally loved his eaſe and pleaſure, which did not however loſe him the reſpect and attachment of his people.

As long as harmony prevailed in his family, he left the entire management of all the affairs of government to SEDASHEO * ROW BHOW, and gave himſelf up to pleaſure.

SEDASHEO, from his earlieſt years, had ſtudied every branch of the art of government, the regulation of the finances and the army, and the conduct of all publick affairs, under the inſtruction of RAMCHUNDRA BABA *Sindhvi*, the greateſt ſtateſman of the age; and from the firſt watch of the day till the middle of the night, applied to the publick buſineſs. By his great experience, addreſs, and ability, he brought men over to his opinion, to a co-operation in his meaſures, and a perfect reliance upon his wiſdom and ability. Several important affairs both in the *Decan* and the provinces had been brought to a concluſion by his means; and at length an expedition was fitted out for completing the conqueſt of *Hindoſtan*, under

* Properly, *Sadáſiva*.

the

the ſupreme command of RAGHUNAUT ROW. MULHAR ROW HULKAR, JUNKOOGEE SINDIA, and ſeveral other chiefs, were ordered to act under him with very powerful forces. They accordingly marched into *Hindoſtan*, and with little difficulty reduced every place to their obedience, until they came to the neighbourhood of *Lahore* and *Shahdowla*: here they were oppoſed by JEHAN KHAN and the other commanders left in thoſe diſtricts by AHMED SHAH DURRANNY, whom they defeated and compelled to repaſs the *Attock*. They kept poſſeſſion of that country for ſome time, but the army beginning to fall conſiderably in arrears, RAGHUNAUT ROW thought it adviſable to return to the *Decan*.

Upon the return of RAGHUNAUT ROW, the accounts of his expedition being inſpected by the BHOW, it was found that a debt of eighty-eight lacs of rupees was due to the army, ſo much had the expences been allowed to exceed all the collections of tribute, *piſhcuſh*, &c. The BHOW, who was in every reſpect ſuperior to RAGHUNAUT, reproached him ſeverely for this, and aſked him if that was his good management, to bring home debts inſtead of an increaſe of wealth to the treaſury of the ſtate: which RAGHUNAUT ROW replied to, by adviſing him to try his own ſkill next time, and ſee what advantage he could make of it. BALLA ROW however interfered, and reconciled them in ſome degree, by excuſing RAGHUNAUT ROW on account of his youth and inexperience.

Next year the ſcheme of reducing *Hindoſtan* being renewed, and the command again offered to RAGHUNAUT ROW, he declined it, ſaying, "Let thoſe have the "command who are well-wiſhers to the ſtate, and who will conſult the public ad-"vantage." This ſpeech gave great offence to the BHOW, and, on many conſiderations, he offered himſelf to take the command of the expedition; taking with him BISWAS ROW, the eldeſt ſon of BALA ROW, then ſeventeen years of age, as the nominal commander in chief, according to the ancient cuſtom of the *Mahrattas* *. The army under his command was very numerous, and they ſet out on their expedition without delay; but, as ſoon as they had paſſed the *Nerbudda* †, the BHOW began to exerciſe his authority in a new and offenſive manner, and both in ſettling the accounts of the army and revenue, and in all publick buſineſs, he ſhowed a capricious and ſelf-conceited conduct. He totally excluded from his council MULHAR ROW, and all the other chiefs, who were experienced in the affairs of *Hindoſtan*, and who had credit and influence with the principal people in that country, and carried on every thing by his own opinion alone.

* Properly *Mahárâſhtras*.

† Properly *Nermada*.

When

When he came to *Seronga*, he diſpatched *Vakeels* with preſents to all the principal chiefs in *Hindoſtan*, inviting them to an alliance and co-operation with him, for the purpoſe of ſettling the affairs of *Hindoſtan*. Among the reſt a *Vakeel* came with the above propoſal to the *Navab* SHUJAH-UL-DOWLAH, bringing with him a preſent of fine cloths and jewels, to a conſiderable amount; and informing him at the ſame time, that whenever the BHOW ſhould arrive near him, he would diſpatch NAROO SHUNKER to conduct SHUJAH-UL-DOWLAH to him. SHUJAH-UL-DOWLAH anſwered him in the language of profeſſion, but determined in his own mind to keep himſelf diſengaged from both parties, and to be a ſpectator of the expected conteſt till his future conduct ſhould be determined by the event, when he deſigned to join the victors.

AHMED SHAH DURRANY, after the defeat of DATTEA JEE PUTUL SINDIA, cantoned his army in the diſtrict of *Anuffhair*, upon the banks of the *Ganges*; and DATTEA JEE PUTUL himſelf having been killed in an action with NUJEIB-UL-DOWLAH, the latter was apprehenſive of the conſequences of the reſentment of the *Mahrattas*, and therefore united himſelf cloſely with the DURANNY SHAH, who was himſelf excited to invade *Hindoſtan* by a wiſh to revenge the defeat of his General JEHAN KHAN the preceding year, but ſtill by the ſolicitations of NUJEIB-UL-DOWLAH, who agreed to bear the extra charges of the SHAH's army, and, being himſelf a man of great military reputation, as well as an able politician, had perſuaded all the *Rohilla* chiefs and the *Patans* of *Ferokhabad* to join the DURRANNY SHAH.

The BHOW, beſides his own *Decany* troops, had brought with him all the auxiliaries that he could collect in *Malwa*, *Janſye*, &c. under the command of the ſeveral *Aumils*, ſuch as NAROO SHUNKER and others; and, as ſoon as he arrived at the river *Chumbul*, he ſent a confidential perſon to *Raja* SURJA MUL, chief of the *Jauts*, propoſing a conference, and that SURJA MUL ſhould enter into alliance with him. SURJA MUL ſent him word in reply, that his negociations with the *Mahrattas* had always been conducted through the mediation of MULHAR ROW and the SINDEAS, and that, if they choſe to interfere on the preſent occaſion, he was ready to wait on the BHOW. The BHOW from neceſſity aſked thoſe chiefs to aſſiſt him in this matter, which they having conſented to, as ſoon as the army of the *Mahrattas* approached to *Agra*, SURJA MUL paid his reſpects to the BHOW; and the converſation turning on the moſt adviſable mode of conducting the war, SURJA MUL ſaid, "You are the maſter of *Hindoſton*, poſſeſſed of all things; I am

"but

" but a *Zemindar*, yet will give my advice according to the extent of my compre-
" henſion and knowledge. In the firſt place, the families of the chiefs and ſoldiers,
" the large train of baggage, and the heavy artillery, will be great impediments to
" carrying on the kind of war which you have now in hand. Your troops are
" more light and expeditious than thoſe of *Hindoſtan*; but the *Durranies* are ſtill
" more expeditious than you. It is therefore adviſable to take the field againſt
" them quite unincumbered, and to leave the ſuperfluous baggage and followers
" on the other ſide of the *Chumbul*, under the protection of *Janſye* or *Gualiar*;
" which places are under your authority.

" Or, I will put you in poſſeſſion of one of the large forts in my country, *Dieg*,
" or *Combeir*, or *Burtpoor*, in which you may lodge the baggage and followers;
" and I will join you with all my forces. In this arrangement you will have the
" advantage of a free communication with a friendly country behind you, and need
" be under no apprehenſions reſpecting ſupplies to your army: and there is reaſon
" to believe, that the enemy will not be able to advance ſo far, but will by this plan
" of operations be obliged to diſperſe, without effecting any thing."

MULHAR ROW and the other chiefs approved of this advice, and obſerved,
" that trains of artillery were ſuitable to the royal armies, but that the *Mahratta*
" mode of war was predatory; and their beſt way was to follow the method to
" which they had been accuſtomed; that *Hindoſtan* was not their hereditary poſſeſ-
" ſion, and, if they could not ſucceed in reducing it, it would be no diſgrace to
" them to retreat again. That the advice of SURJA MUL was excellent; and that
" the plan which he propoſed would certainly compel the enemy to retreat, as they
" had no fixed poſſeſſion in the country. That their object for the preſent, there-
" fore, ſhould be to gain time till the breaking up of the rains, when the *Durranies*
" would certainly return to their own country."

Notwithſtanding that all the *Mahratta* chiefs were unanimous in recommending this plan, the BHOW, relying on the ſtrength of his army, and his own courage and ability, would not liſten to it, but ſaid, " that his inferiors had acquired military
" reputation by their actions in that country; and it never ſhould be reproached to
" him, that he, who was the ſuperior, had gained nothing but the diſgrace of acting
" defenſively." And he reproached MULHAR ROW with having outlived his activity and his underſtanding: at the ſame time ſaying " that SURJA MUL was only
" a *Zemindar*; that his advice was ſuitable enough to his rank and capacity, but not
" worth the conſideration of men ſo much his ſuperiors."

Men of wiſdom and experience were ſurprized at this arrogance and obſtinacy in a man who always formerly had ſhown ſo much good ſenſe and circumſpection as the BHOW had done till this expedition: and concluded, that fate had ordained the miſcarriage of their enterprize. Every one became diſguſted by his harſh and offenſive ſpeeches; and they ſaid among themſelves, "It is better that this *Brahmin* "ſhould once meet with a defeat, or elſe what weight and conſideration ſhall we be "allowed?"

The BHOW poſted a body of troops to prevent SURJA MUL from leaving the camp: this alarmed him very much, but, as all the chiefs were of one opinion, MULHAR ROW and the reſt adviſed him not to be haſty, but to act as circumſtances ſhould direct; and, for the preſent, to remain for the ſatisfaction of the BHOW.

After this the BHOW marched from *Agra* to *Dehly*, and at once laid ſiege to the royal caſtle, where YACOOB ALY KHAN (who was nephew to the *Durrany Vizier*, SHAH VULLI KHAN) commanded, and ſummoned him to ſurrender the caſtle, after the batteries had played ſome days. YACOOB ALY KHAN finding that reſiſtance was vain, by the advice of SHAH VULLI KHAN, capitulated through the other *Mahratta* chiefs' mediation, and delivered the caſtle up to the BHOW, who entered it with BISWAS ROW, and ſeized upon a great part of the royal effects that he found there: eſpecially the ceiling of the great hall of audience, which was of ſilver, and made at an immenſe expence, was pulled down and coined into ſeventeen lacks of rupees. Many other actions of the ſame kind were done, and it was generally reported to be the BHOW's deſign to get rid of ſuch of the principal *Hindoſtany* chiefs as ſtood in his way; and, after the DURRANY SHAH ſhould return to his own country, to place BISWIS ROW upon the throne of *Dehly*. This intelligence was brought to the *Navab* SHUJAH-UL-DOWLAH, and it is on his authority that I relate it.

In the mean time the rains ſet in, and the BHOW cantoned his army in *Dehly*, and for twelve coſs round it, reſiding himſelf in the caſtle; while AHMED SHAH DURRANNY remained in cantonments near *Anuſſhair*. NUJEIB-UL-DOWLAH gave him exact information of every thing that paſſed; upon which intelligence the SHAH told him, "that as SHUJAH-UL-DOWLAH was a chief of great weight and "power, and vizier of *Hindoſtan*, it was of the greateſt importance to ſecure him to "their intereſt, and to perſuade him to join them; for that, ſhould he be gained "by the *Mahrattas*, the worſt conſequences muſt ariſe from it. That it was not

"neceſſary

" neceſſary that he ſhould bring a large army with him: his coming even with a " few would very conſiderably ſtrengthen their cauſe. That on a former occaſion, " when he (AHMED SHAH) invaded *Hindoſtan*, SHUJA-UL-DOWLAH's father, SUF- " DAR JUNG, had oppoſed him, and been the principal means of his failure. That " no doubt this would make SHUJAH-UL-DOWLAH apprehenſive and ſuſpicious of " him, and therefore NUJEIB-UL-DOWLAH muſt endeavour by every means to get " the better of that obſtacle, leſt SHUJA-UL-DOWLAH ſhould join the oppoſite " party. That this was a negotiation too nice and important to be conducted by " *Vakeels*, or by letters, and that therefore NUJEIB-UL-DOWLAH muſt go himſelf " with a ſmall eſcort, and in perſon prevail on SHUJA-UL-DOWLAH to join " them."

AHMED SHAH DURRANY and his vizier, SHAH VULLI KHAN, ſent written treaties of alliance, and the *Khoran* ſealed with their ſeals, by NUJEIB-UL-DOWLAH, who, taking his leave of the DURRANY SHAH, ſet out with an eſcort of two thouſand horſe, and in three days got to *Mindy Gaut*, on the *Ganges*.

SHUJAH-UL-DOWLAH, ſome time before this, had been encamped on his frontier near the *Ganges*, for the protection of his country, and, receiving information of NUJEIB-UL-DOWLAH's ſudden arrival, he found himſelf under the neceſſity of giving him a meeting, and ſhowing him all the honours which hoſpitality and politeneſs demanded. NUJEIB-UL-DOWLAH ſhowed him the treaties propoſed by the DURRANY SHAH, and gave him every aſſurance and encouragement poſſible, both from the DURRANY SHAH and from himſelf; and explained to him alſo the perils of their own ſituation. " For my own part," ſaid he, " I give over every " hope of ſafety, when I reflect that the BHOW is my declared enemy; but it be- " hoves you alſo to take care of yourſelf, and to ſecure an ally in one of the par- " ties: and, as you know the BHOW bears a mortal hatred to all *Muſſulmans*, " whenever he has the power to ſhow his enmity, neither you nor I, nor any other " *Muſſulman*, will eſcape. Though, after all, the deſtiny of GOD will be fulfilled, " yet we ought alſo to exerciſe our own faculties to their utmoſt. From my friend- " ſhip to you, I have come this diſtance to explain things to you, though averſe " from all unneceſſary trouble. Now conſider and determine. The *Begum* your " mother is capable of adviſing us both: conſult her upon the occaſion, as well as " the reſt of your family, and determine on what you ſhall think beſt."

After conſidering the matter for two or three days, SHUJA-UL-DOWLAH concluded, that it would be very unſafe and improper to join the *Mahrattas*: and to decline

decline the proffered friendſhip of the other party, would be impolitick, eſpecially after their deputing a man of NUJEIB-UL-DOWLAH's rank to him; and would never be forgiven either by the SHAH or the *Rohilla* chiefs. Yet the danger appeared very great, whether the victory ſhould fall to the *Mahrattas* or to the *Durranies*. He at length however determined to follow the advice of NUJEIB-UL-DOWLAH, and to join the DURRANY SHAH. He accordingly diſpatched his women to *Lucknow*, appointed *Raja* BENI BEHADER *Naib Subah* during his abſence, and, ſetting out with NUJEIB-UL-DOWLAH, and arriving at the *Durrany* camp near *Anuſſhair*, was preſented to AHMED SHAH DURRANY, who treated him with the greateſt conſideration and honour, told him that he conſidered him as one of his *own children*; that he had waited for his arrival, and now would ſhew him the puniſhment of the *Mahrattas*, with many proofs of his friendſhip. He at the ſame time proclaimed it through his own camp, that no *Durrany* ſhould preſume to commit any violence or irregularity in SHUJA-UL-DOWLAH's camp: that any one who did, ſhould be put to immediate death; adding, that SHUJA-UL-DOWLAH was the ſon of SUFDER JUNG, the gueſt of AHMED SHAH's family; and that he conſidered him as dear as his own child. The grand vizier SHAH VULLI KHAN, who was a man in the higheſt eſteem and reſpect with all ranks, called SHUJA-UL-DOWLAH his ſon alſo, and treated him with the higheſt diſtinction.

As the common ſoldiers among *Durranies* are ſtubborn and diſobedient, notwithſtanding the SHAH's proclamation, they committed ſome irregularities in SHUJA-UL-DOWLAH's camp: the SHAH hearing of this, had two hundred of them ſeized upon, and, having had their noſes bored through with arrows, and ſtrings paſſed through the holes, they were led in this condition, like camels, to SHUJA-UL-DOWLAH, to be put to death or pardoned, as he ſhould think proper. He accordingly had them releaſed; and from that time none of the *Durrany* ſoldiers made the leaſt diſturbance in SHUJA-UL-DOWLAH's camp.

Soon after this, though the rains were ſtill at their height, the SHAH marched from *Anuſſhair*, and cantoned his army at *Shahdera*, on the bank of the *Jumna*, oppoſite to the city of *Debly*. Many poſts of the *Mahratta* army were within ſight; but the river was too deep and rapid to be paſſed.

The BHOW ſent BOWANY SHUNKER PUNDIT, a native of *Aurungabad*, and a man of good ſenſe and experience, with ſome overtures to SHUJA-UL-DOWLAH; telling him that there was no ground for enmity between the *Mahrattas* and his Excellency's family; on the contrary, they had formerly given great ſupport and aſſiſtance

ance to SUFDER JUNG, SHUJA-UL-DOWLAH's father. Why then did the *Navab* join their enemies? That their not having long ſince deſired him to join them in perſon, was ſolely owing to their unwillingneſs to give him inconvenience. That now it was by all means neceſſary for him to join them, or at leaſt to ſeparate himſelf from the other party, and to ſend ſome perſon of character and rank, on his part, to reſide within the camp.

Accordingly the *Navab* ſent RAJA DEBYDUT, a native of *Dehly*, who was in his ſervice; a man of great eloquence (whoſe father had been the royal treaſurer during the adminiſtration of the *Syeds*; and he himſelf had been one of the houſehold during the reign of MOHAMMED SHAH) to accompany BOWANNY SHUNKER. The *Navab* alſo ſent ROW CASY RAJ (the writer of this narrative), who had been in the ſervice of SUFDER JUNG, and much favoured by him. His excellency told BOWANY SHUNKER that I (CASY RAJ) was alſo a *Decany*, and introduced me to him in his own preſence; where we ſoon recognized our being of the ſame caſt and country. BOWANY SHUNKER wrote the BHOW word of my being employed in this affair; upon which the BHOW cauſed a lettter to be written to me in the *Decan* language; but as there was ſome deficiency in the form of addreſs, I did not reply to it. The BHOW enquired of BOWANY SHUNKER why I neglected to anſwer his letter; which being explained, he was very angry with his *Munſhy*.

When *Raja* DEBYDUT got to the BHOW's camp, the negociation began; but the BHOW being diſſatisfied with this agent, he ſent BOWANY SHUNKER back to tell SHUJA-UL-DOWLAH that *Raja* DEBYDUT was too unguarded a man to be entruſted with ſecrets of ſuch importance: he therefore deſired the *Navab* would ſend a truſty man entirely to be relied on, and ſend word by him preciſely what ſteps were to be purſued.

At the ſame time other overtures came from MULHAR ROW and *Raja* SURJA MUL, to know what part they ſhould act. All theſe propoſals the *Navab* communicated exactly to NUJEIB-UL-DOWLAH and the grand vizier; and negociated with the *Mahrattas* by their advice.

NUJEIB-UL-DOWLAH threw every obſtacle that he could in the way of peace; but the grand vizier told SHUJA-UL-DOWLAH, that, if a peace could be brought about through his means, it would be better; that he was very willing to forward it, and would engage to obtain the SHAH's concurrence. In fact, he was at this time on but indifferent terms with NUJEIB-UL-DOWLAH.

At length it was reſolved to ſend the eunuch MOHAMMED YACOOB KHAN with their

their propoſals to the *Mahrattas*, and to tell them from SHUJA-UL-DOWLAH, that he acknowledged the friendſhip which had always ſubſiſted between them and him; that however it was neither proper nor practicable for him to join them, but that on every proper occaſion he was ready to manifeſt his friendſhip, by giving them the beſt intelligence and advice; and, ſince they aſked his opinion in the preſent inſtance, he would adviſe them to avoid attempting any other mode of carrying on the war, than the predatory and deſultory one, to which they were accuſtomed: or that, if they preferred peace, means ſhould be deviſed for obtaining it.

They at the ſame time wrote to *Raja* SURJA MUL, adviſing him to quit the *Mahrattas*, and return to his own country; which advice coinciding with his own opinion, he promiſed to follow it.

The BHOW, in anſwer to SHUJA-UL-DOWLAH, acknowledged the kindneſs of his advice and conduct, and promiſed to pay attention to what he had ſaid. That as to peace, he had no cauſe of quarrel with the DURRANY SHAH, who might march back to his own country, whenever he pleaſed; that all the country on the other ſide of the *Attock* ſhould remain in the poſſeſſion of the SHAH, and all on this ſide of it ſhould belong to the chiefs of *Hindoſtan*, who might divide and ſettle it as they could agree among themſelves. Or, if this ſhould not ſatisfy the SHAH, he ſhould poſſeſs as far as *Lahore*. Laſtly, he ſaid, that, if the SHAH inſiſted on ſtill more, he ſhould have as far as *Sirhind*, leaving the remainder to the chiefs of *Hindoſtan*, as was ſaid before. With this anſwer, YACOOB KHAN returned.

Two days after this, SURJA MUL, who was encamped at *Bidderpoor*, ſix coſs from *Dehly*, by the advice of MULHAR ROW and the other diſaffected chiefs, under pretence of changing the ground of his encampment, ſent off all his baggage and camp-followers towards his own country, and, when he received intelligence that they had got ten coſs on their way, he followed them with his diviſions of troops, and had got a great diſtance, before the BHOW heard of his departure. In a day and two nights he marched fifty coſs, and reached the ſtrong holds of his own country.

The BHOW made no account of his defection, only ſaying, that ſuch conduct was to be expected from mere *Zemindars*; that his going was of no importance, but rather to be rejoiced at, ſince he did not quit them at any time, when they might have relied on him for material ſervice.

MAHOMMED YACOOB KHAN, returning to camp, reported all the BHOW's overtures;

tures; but, as neither party were ſincerely in earneſt, the negociation went on but ſlowly.

Meantime, the rains drawing near to an end, the BHOW determined to reduce the ſtrong poſt of *Kunjpoora*, which is ſituated on the banks of the *Jumna*, about fifty coſs above *Dehly*, at that time occupied by about 10,000 *Rohillas*, as the poſſeſſion of that place would ſecure his paſſing the river to attack the SHAH. He accordingly marched from *Dehly*, and, arriving at *Kunjpoora*, aſſaulted it with fifteen thouſand choſen men; and after an obſtinate reſiſtance made himſelf maſter of the place, taking the governor DULEIL KHAN, and all the garriſon, priſoners, and delivering up the place to plunder. The DURRANY SHAH had exact intelligence of all this proceeding, and was very deſirous of relieving *Kunjpoora*; but the *Jumna* was yet impaſſable.

Soon after the rains broke up, and the *Duſſura* arrived: the SHAH gave orders, that the day before the *Duſſura*, all the army ſhould be aſſembled for muſter; which being done, he reviewed them himſelf from an eminence in front of the camp.

The *Durrany* army conſiſted of twenty-four *Duſtas* (or regiments), each containing twelve hundred horſemen. The principal chiefs in command under the SHAH, were the grand vizier SHAH VULLI KHAN,—JEHAN KHAN,—SHAH PUSSUND KHAN,—NUSSIR KHAN BELOCHE,—BERKHORDAR KHAN,—*Vizier* ULLA KHAN *Kizelbaſhi*,—MORAD KHAN, a *Perſian Moghol*.—Beſides theſe principal chiefs, there were many others of inferior rank; and of the twenty-four *Duſtas* above-mentioned, ſix were of the SHAH's ſlaves, called *Koleran*.

There were alſo two thouſand camels, on each of which were mounted two muſketeers, armed with pieces of a very large bore, called *Zamburucks*; forty pieces of cannon, and a great number of *ſhuternals*, or ſwivels, mounted on camels: this was the ſtrength of the *Durrany* army.

With the *Navab* SHUJA-UL-DOWLAH there were two thouſand horſe, two thouſand foot, and twenty pieces of cannon of different ſizes:

With NUJEIB-UL-DOWLAH, ſix thouſand horſe, and twenty thouſand *Rohilla* foot, with great numbers of rockets:

With DOONDY KHAN and HAFIZ RAHMUT KHAN, fifteen thouſand *Rohilla* foot and four thouſand horſe, with ſome pieces of cannon:

And with AHMED KHAN BUNGASH, one thouſand horſe, one thouſand foot, with ſome pieces of cannon, making altogether forty-one thouſand eight hundred horſe,

horſe, and thirty-eight thouſand foot, with between ſeventy and eighty pieces of cannon.

This I know to have been preciſely the ſtate of the *Muſſulman* army, having made repeated and particular inquiries before I ſet it down, both from the dufter (or office) of muſters, and from thoſe by whom the daily proviſions were diſtributed. But the numbers of irregulars who accompanied theſe troops, were four times that number; and their horſes and arms were very little inferior to thoſe of the regular *Durranies*. In action, it was their cuſtom immediately after the regulars had charged and broken the enemy, to fall upon them ſword in hand, and complete the rout. All the *Durranies* were men of great bodily ſtrength, and their horſes of the *Turki* breed; naturally very hardy, and rendered ſtill more ſo by continual exerciſe.

AHMED SHAH DURRANY iſſued orders to his army to be ready to march two days after the muſter.

On the other ſide, the BHOW, having reduced *Kunjpoora*, returned to *Dehly*, and ordered a muſter of his army; when the ſtrength of it appeared to be as follows:

Under IBRAHIM KHAN GARDEE, two thouſand horſe, and nine thouſand ſepoys with firelocks, diſciplined after the *European* manner; together with forty pieces of cannon.

The *Khaſs Pagāh*, or houſehold troops,	6,000 horſe.
MULHAR ROW and HULKER,	5,000 horſe.
JUNKOOJEE SINDIA,	10,000 horſe.
AMAJEE GUICKWAR,	3,000 horſe.
JESWONT ROW, POWAR,	2,000 horſe.
SHUMSHERE BEHADER,	3,000 horſe.
BELAJEE JADOON,	3,000 horſe.
RAJAH BETUL SHUDEO,	3,000 horſe.
BULMONT ROW, brother-in-law to the BHOW, and his great adviſer in every thing,	7,000 horſe.
BISWAS ROW's own Pāgāh,	5,000 horſe.
ANTAGEE MANKESER,	2,000 horſe.

There were ſeveral other ſmaller bodies, which cannot now be recollected: the whole army amounted to fifty-five thouſand horſe, and fifteen thouſand foot, including IBRAHIM KHAN's ſepoys.

There

There were alſo two hundred pieces of cannon, and rockets and *ſhuternals* without number.

Beſides theſe, the *Pindary* chiefs, CHURGORY and HOOL SEWAR, had fifteen thouſand *Pindarries* under their authority; and there were two or three thouſand horſe with the *Rhatore* and *Cutchwa* vakeels. Theſe, with five or ſix thouſand horſe more, were left to guard *Dehly*, under the command of BOWANY SHUNKER.

Two days after the *Duſſara*, which was the 17th of *October*, 1760, AHMED SHAH DURRANY marched from his camp, ordering his baggage to follow the army; and marching all night, encamped next day at the ford of *Baugput*, eighteen coſs above *Dehly*. He ſearched in vain for the ford, the river being ſtill very high, and ſeveral horſemen, attempting to paſs, were drowned. The SHAH having faſted and performed religious ceremonies for two days, on the third a ford was diſcovered, but it was very narrow, and on each ſide the water was ſo deep, as to drown whoever went the leaſt out of the proper track.

The troops began to paſs the ford on the 23d of *October*, and the SHAH himſelf paſſed as ſoon as half of his army was on the other ſide. The whole army was completely croſſed in two days; but from their numbers and the great expedition uſed, many people loſt their lives.

As ſoon as the army had croſſed, the SHAH marched towards the enemy, who alſo moved to meet him; and on the 26th of *October*, in the afternoon, the *Herawil* (or advanced guard) of the two armies, met each other near *Sumalkeh Seray*, and an action enſued, in which the *Mahrattas* had the diſadvantage, and retreated at ſunſet with the loſs of near two thouſand men, while not more than one thouſand were killed and wounded on the part of AHMED SHAH. The SHAH's army returned to their camp.

The next day AHMED SHAH moved forward again, and ſo on for ſeveral days ſucceſſively, conſtantly ſkirmiſhing, but ſtill gaining ground on the *Mahrattas*, till they came to *Paniput*, where the BHOW determined to fix his camp, which he accordingly did, and incloſed that, as well as the town of *Paniput*, with a trench ſixty feet wide and twelve deep, with a good rampart, on which he mounted his cannon. The SHAH encamped about four coſs from the *Mahratta* lines; and, as he had always during his march, ſurrounded his camp at night with felled trees, ſo in this camp, which was to remain fixed for ſome time, the abattis was made ſomething ſtronger, and the chiefs encamped in the following order:

The SHAH in the centre;
On his left, SHUJA-UL-DOWLAH;
On his left, NAJEIB-UL-DOWLAH;
On the right of the SHAH, HAFIZ RAHMUT KHAN;
On his right, DOONDY KHAN;
On his right, AHMED KHAN BUNGUS.

The ſpace occupied by the whole front was near three coſs and a half.

The BHOW had before given orders to GOBIND PUNDIT, who had the command and collections of *Korah*, *Kurrah*, *Etawa*, *Shekoabad*, and the reſt of the *Doab*, as well as of *Kalpee*, and other diſtricts acroſs the *Jumna*, as far as *Saghur*, to collect all the forces he poſſibly could, and to cut off all communication for proviſions from the rear of the SHAH's army. GOBIND PUNDIT having got together ten or twelve thouſand horſe, advanced as far as *Mirhet*, in the rear of the SHAH, and ſo effectually cut off all ſupplies, that the SHAH's army was in the greateſt diſtreſs for proviſions, coarſe flour ſelling for two rupees per ſeer, and the troops conſequently very much diſſatisfied. The SHAH therefore detached ATTAI KHAN, nephew to the grand vizier, with a *Duſta*, conſiſting of two thouſand choſen horſe, and ordered him to march day and night, till he ſhould come up with GOBIND PUNDIT, and having cut off his head, to bring it to the preſence. He ſet out accordingly, being joined by eight or ten thouſand of the irregulars, and having marched about forty coſs during the night, at day break they fell like lightning upon the camp of GOBIND PUNDIT; where, having no intelligence of the *Durranies'* approach, they were ſeized with terror and amazement, and fled on all ſides. GOBIND PUNDIT himſelf attempted to eſcape upon a *Turki* horſe; but being old, and not a very expert horſeman, he was thrown off in the purſuit; and the *Durranies* coming up, cut off his head and carried it to the camp, where it was recognized for the head of GOBIND PUNDIT.

After plundering the enemy's camp, and driving away their ſcattered troops on all ſides, ATTAI KHAN returned to the SHAH's camp, the fourth day from that on which he was detached, and preſented his Majeſty with the head of GOBIND PUNDIT. The SHAH was highly pleaſed with this effectual performance of his orders, and beſtowed a very honourable *Khalat* on ATTAI KHAN. After this action, the *Durrany* army was conſtantly ſupplied with proviſions.

The BHOW was much affected with this news, eſpecially as it was accompanied with other events little favourable to his cauſe: but as he was a man of dignity and reſolution,

reſolution, he never betrayed any deſpondency, but made light of all the adverſe circumſtances which occurred.

Soon after the defeat of GOBIND PUNDIT, the BHOW ſent two thouſand horſe to *Dehly*, to receive ſome treaſure from NAROO SHUNKER, for the uſe of the army. Theſe troops were inſtructed to march privately, by night, and by unfrequented roads, and each man to have a bag of two thouſand rupees given him to carry, as far as the ſum they ſhould receive would go. They executed their orders completely, as far as to the laſt march, on their return to the camp; but unluckily for them, the night being dark, they miſtook their road, and went ſtrait to the *Durrany* camp inſtead of their own. On coming to the outpoſts, thinking them thoſe of their own camp, they began to call out in the *Mahratta* language, which immediately diſcovering them to the *Durrannies*, they ſurrounded the *Mahrattas*, cut them to pieces, and plundered the treaſures.

From the day of their arrival in their preſent camp, AHMED SHAH DURRANY cauſed a ſmall red tent to be pitched for him a coſs in front of his camp, and he came to it every morning before ſun-riſe; at which time, after performing his morning-prayer, he mounted his horſe, and viſited every poſt of the army, accompanied by his ſon TIMOUR SHAH and forty or fifty horſemen. He alſo reconnoitred the camp of the enemy, and, in a word, ſaw every thing with his own eyes, riding uſually forty or fifty coſs every day. After noon he returned to the ſmall tent, and ſometimes dined there, ſometimes at his own tents in the lines; and this was his daily practice.

At night there was a body of five thouſand horſe advanced as near as conveniently might be, towards the enemy's camp, where they remained all night under arms: other bodies went the rounds of the whole encampment; and AHMED SHAH uſed to ſay to the *Hindoſtany* chiefs, "Do you ſleep, I will take care that no harm befalls you:" and to ſay the truth, his orders were obeyed like deſtiny, no man daring to heſitate or delay one moment in executing them.

Every day the troops and cannon on both ſides were drawn out, and a diſtant cannonade with many ſkirmiſhes of horſe took place: towards the evening both parties drew off to their camps. This continued for near three mouths: during this time there were three very ſevere, though partial, actions.

The firſt was on the 29th *November*, 1760, when a body of *Mahrattas*, about fifteen thouſand ſtrong, having fallen upon the grand vizier's poſt on the left of the line, preſſed him very hard; till a reinforcement coming to his aſſiſtance, the action became

became very obſtinate: the *Mahrattas*, however, gave way about ſun-ſet, and were purſued to their own camp with great ſlaughter. Near four thouſand men were killed on the two ſides in this action.

The ſecond action was on the 23d of *December*, 1760, when NUJEIB-UL-DOWLAH having advanced pretty forward with his diviſion, he was attacked with ſo much vigour by BULMONT ROW, that his troops gave way, and only fifty horſemen remained with him; with which ſmall number, however, he kept his ground, till a reinforcement came to his aſſiſtance; the action was then renewed with great fury, and above three thouſand of NUJEIB-UL-DOWLAH's men were killed or wounded. Among the killed was KHALIL-UL-RAHMAN, uncle to NUJEIB-UL-DOWLAH. In the laſt charge, which was at near nine o'clock at night, BULMONT ROW was killed by a muſket-ball: upon which both parties retired to their own camps.

The third action was much in the ſame way; and thus every day were the two armies employed, from morning to nine or ten at night, till at length the *Hindoſtany* chiefs were out of all patience, and entreated the SHAH to put an end to their fatigues, by coming at once to a deciſive action; but his conſtant anſwer was, "This "is a matter of war, with which you are not acquainted. In other affairs do as you "pleaſe, but leave this to me. Military operations muſt not be precipitated. You "ſhall ſee how I will manage this affair; and at a proper opportunity will bring it "to a ſucceſsful concluſion."

As the *Durrany* army was vigilant both by day and night, to prevent the approach of any convoys, there began to be a great ſcarcity of proviſions and forage in the *Mahratta* camp.

One night when about twenty thouſand of their camp-followers had gone out of the lines, to gather wood in a jungle at ſome diſtance, they happened to fall in with a body of five thouſand horſe, under the command of SHAH PUSSUND KHAN, who had the advanced guard that night, and who ſurrounded them on all ſides, put the whole to the ſword, no perſon coming to their aſſiſtance from the *Mahratta* camp. In the morning, when the affair was reported to the SHAH, he went out with moſt of his chiefs to the ſcene of the ſlaughter, where dead bodies were piled up into a perfect mountain!—ſo great had been the deſtruction of thoſe unhappy people.

The grief and terror which this event ſtruck into the *Mahrattas*, is not to be deſcribed; and even the BHOW himſelf began to give way to fear and deſpondence.

There

There was a news-writer of the BHOW's, called GONNEISH PUNDIT, who remained in the camp of the *Navab* SHUJA-UL-DOWLAH; but not being of ſufficient importance to obtain acceſs to the *Navab*, any buſineſs that he had with the *Durbar*, he tranſacted through my means. Through this channel the BHOW often wrote letters to me, with his own hand, deſiring that I would urge the *Navab* to mediate a peace for him, in conjunction with the grand vizier; that he was ready to ſubmit to any conditions, if he could but preſerve himſelf and his army, and would by every means manifeſt his gratitude to the mediators. He alſo ſent a handful of ſaffron (as is a cuſtom with theſe people) and a written engagement (to which he had ſworn) to abide by this promiſe; together with a turban ſet with rich jewels, as an exchange for one to be received from the *Navab*, who alſo returned proper preſents, and promiſed to aſſiſt him.

The *Navab* often ſent me to the vizier upon this buſineſs. He was alſo very well diſpoſed to liſten to the BHOW's propoſals, and ſpoke to the SHAH about it. The SHAH ſaid, "That he had nothing to do in the matter; that he came thither at "the ſolicitation of his countrymen the *Rohillas*, and other *Muſſulmans*, to relieve "them from their fear of the *Mahratta* yoke; that he claimed the entire conduct "of the war, but left the *Hindoſtany* chiefs to carry on their negociations as they "pleaſed, themſelves."

All the other chiefs, HAFIZ RAAMUT KAAN, DOONDY KHAN, and AHMED KHAN BUNGISH, were alſo ſatisfied to make peace with the BHOW; but every one ſtipulated that NUJEIB-UL-DOWLAH muſt alſo be ſatisfied to do ſo, otherwiſe they could not conſent. Accordingly the *Navab* SHUJA-UL-DOWLAH ſent me to talk over the matter with NUJEIB-UL-DOWLAH, and to obtain his conſent. I therefore waited upon him, and, in a long private conference, I explained every thing that had paſſed, and urged every argument to perſuade him to come into the views of the other chiefs: to which he replied in nearly the following words: "SHUJA-UL-"DOWLAH is the ſon of a man, whom I look up to as my ſuperior; and I con-"ſider him alſo in the ſame light; but at the ſame time, he is young and unac-"quainted with the world: he does not ſee to the bottom of things. This buſineſs "is a deception: when an enemy is weak and diſtreſſed, there is no conceſſion "that he will not make, and, in the way of negociation, will ſwear to any thing; "but oaths are not chains, they are only words. After reducing an enemy to this "extremity, if you let him eſcape, do you think he will not ſeize the firſt oppor-"tunity to recover his loſt honour and power? At preſent we may be ſaid to have

"the

" the whole *Decan* at our mercy; when can we hope for another juncture ſo fa-
" vourable? By one effort we get this thorn out of our ſides for ever.—Let the
" *Navab* have a little patience; I will wait upon him myſelf, and conſult what is
" beſt to be done."

After this anſwer, I left NUJEIB-UL-DOWLAH, and returned to my maſter, to whom I repeated all that had paſſed, aſſuring him that NUJEIB-UL-DOWLAH would never be brought to agree to any terms of pacification.

As ſoon as I had left NUJEIB-UL-DOWLAH, though it was the middle of the night, he went immediately to the SHAH, and informed him of what had paſſed. " All the chiefs (ſaid he) are inclined to make peace with the *Mahrattas*, but I
" think it by no means adviſeable. The *Mahrattas* are the thorn of *Hindoſtan*; if
" they were out of the way, this empire might be your Majeſty's whenever you
" ſhould pleaſe. Do as ſeems fit to yourſelf. For my own part, I am a ſoldier of
" fortune, and can make terms with whatever party may prevail."

The SHAH replied, " You ſay truly: I approve of your counſel, and will not
" liſten to any thing in oppoſition to it. SHUJA-UL-DOWLAH is young and inex-
" perienced, and the *Mahrattas* are a crafty race, on whoſe pretended penitence no
" reliance is to be placed. I from the beginning made you the manager of this
" affair, act as ſeems beſt to yourſelf: in my ſituation I muſt hear every one, but I
" will not do any thing againſt your advice."

Next day NUJEIB-UL-DOWLAH came to SHUJA-UL-DOWLAH's tent, where they conſulted till late at night, but without coming to any concluſion.

By this time the diſtreſſes in the BHOW's camp were ſo great, that the troops plundered the town of *Paniput* for grain; but ſuch a ſcanty ſupply gave no relief to the wants of ſuch multitudes. At length the chiefs and ſoldiers, in a body, ſurrounded the BHOW's tent, and ſaid to him, " It is now two days that we have not
" had any thing to eat; do not let us periſh in this miſery; let us make one ſpirited
" effort againſt the enemy, and whatever is our deſtiny that will happen." The BHOW replied, that he was of the ſame mind, and was ready to abide by whatever they ſhould reſolve upon. At length it was determined to march out of the lines an hour before day-break, and, placing the artillery in front, to proceed to the attack of the enemy. They all ſwore to fight to the laſt extremity; and each perſon took a *betel*-leaf in the preſence of his fellows, in confirmation of this engagement, as is the cuſtom among the *Hindoos*.

In this laſt extremity, the BHOW wrote me a ſhort note with his own hand, which

which he ſent by one of his moſt confidential ſervants. The words of the note were theſe:—

"The cup is now full to the brim, and cannot hold another drop. If any thing "can be done, do it, or elſe anſwer me plainly at once: hereafter there will be no "time for writing or ſpeaking."

This note arrived about three in the morning, at which time I was with the *Navab*. As ſoon as I had read it, I informed his Excellency of its contents, and called in the man who brought it; who told the *Navab* all that had happened in the *Mahratta* camp. While he was doing this, the *Navab*'s harcarrahs brought word, that the *Mahrattas* were coming out of their lines, the artillery in front, and the troops following cloſe behind.

Immediately on hearing this, his excellency went to the SHAH's tent, and deſired the eunuchs to wake his Majeſty that moment, as he had ſome urgent buſineſs with him.

The SHAH came out directly, and enquired what news: the *Navab* replied, that there was no time for explanation, but deſired his Majeſty to mount his horſe, and order the army to get under arms. The SHAH accordingly mounted one of his horſes, which were always ready ſaddled at the tent-door, and, in the dreſs he then had on, rode half a coſs in front of his camp, ordering the troops under arms as he went along.

He enquired of the *Navab* from whom he had his intelligence; and, he mentioning my name, the SHAH immediately diſpatched one on a poſt-camel to bring me. After I had made my obeiſance, he aſked me the particulars of the news. I replied, that the *Mahrattas* had quitted their lines, and would attack his army as ſoon as it ſhould be light. Juſt at this time ſome *Durrany* horſemen paſſed by, with their horſes loaded with plunder, which they ſaid they had taken in the *Mahratta* camp; and added, that the *Mahrattas* were running away. The SHAH looked at me, and aſked me what I ſaid to that? I replied, that a very ſhort time would prove the truth or falſehood of my report. While I was ſpeaking, the *Mahrattas* having advanced about a coſs and a half from their lines, and got their cannon drawn up in a line, all at once gave a general diſcharge of them.

Upon hearing this, the SHAH, who was ſitting upon his horſe, ſmoking a *Perſian Kallian*, gave it to his ſervant, and, with great calmneſs, ſaid to the *Navab*, "Your "ſervant's news is very true, I ſee." He immediately ſent for the Grand *Vizier* SHAH PUSSUND KHAN, who came accordingly: he ordered SHAH PUSSUND

KHAN

KHAN to take poſt, with his diviſion, on the left of NUJEIB-UL-DOWLAH, and conſequently of the whole line; the Grand *Vizier* to take poſt with his diviſion, in the centre of the line; and BERKHORDAR KHAN, with ſome other chiefs, with their troops, on the right of HAFIZ RAHMUT KHAN; and AHMED KHAN BUNGUSH, conſequently of the whole line. When this was done, he ordered the trumpets and other inſtruments to ſound to battle.

By this time objects began to be diſcernible; and we could perceive the colours of the *Mahratta* line advancing ſlowly and regularly, with their artillery in front. The SHAH, rode along the front of the line, and examined the order of all the diviſions. He then took poſt, where his little tent was pitched, in front of his camp, but in the rear of the preſent line of battle, and gave orders for the attack to begin.

The *Mahratta* army faced towards the eaſtward, and their order was as follows, reckoning from the left flank of their line:

IBRAHIM KHAN GARDEE,
AMAJEE GUICKWAR,
SHU DEO PATEIL,
The BHOW, with BISWAS ROW and the houſehold troops,
JESWONT ROW POWAR,
SHUMSHERE BEHADER,
MULHAR ROW,
JUNKOOJEE SINDIA, &c.
} Front.

The whole artillery, *ſhuternals*, &c. were drawn up in front of the line.

The *Muſſulman* army faced toward the weſtward, and was drawn up as follows, reckoning alſo from the left flank of their line:

SHAH PUSSUND KHAN,
NUJEIB-UL-DOWLAH,
SHUJA-UL-DOWLAH,
The Grand *Vizier* SHAW VULLI KHAN,
AHMED KHAN BUNGUSH,
HAFIZ RAHMET KHAN,
DOONDY KHAN,
AMIR BEG KHAN, and other *Perſian Moghols*,
BERKHORDAR KHAN,
} Front.

All the artillery and rockets were in front of the line. Behind them were the camels,

camels, mounted by the muſketeers carrying *Zumburucks*, ſupported by a body of *Perſian* muſketeers.

The two armies facing each other rather obliquely, the diviſions of BERKHORDAR KHAN, AMIR BEG, and DOONDY KHAN, were very near to that of IBRAHIM KHAN GARDEE. The plan of the battle here annexed will explain this more clearly than any deſcription in writing can do.

On the 7th of *January*, 1761, ſoon after ſun-riſe, the cannon, muſketry, and rockets, began to play without intermiſſion, yet our army ſuffered but little by them; for the armies continuing to advance towards each other, the *Mahratta* guns being very large and heavy, and their level not eaſily altered, their ſhot ſoon began to paſs over our troops, and fell a mile in the rear. On our ſide, the cannon fired but little, except from the Grand *Vizier*'s diviſion.

As the armies were advancing towards each other, IBRAHIM KHAN GARDEE rode up to the BHOW, and, after ſaluting him, he ſaid, "You have long been diſ-"pleaſed with me, for inſiſting on the regular monthly pay for my people; this "month your treaſure was plundered, and we have not received any pay at all; "but never mind that; this day I will convince you that we have not been paid ſo "long without meriting it."—He immediately ſpurred his horſe, and returning to his diviſion, he ordered the ſtandards to be advanced, and taking a colour in his own hand, he directed the cannon and muſketry of his diviſion to ceaſe firing; then leaving two battalions oppoſed to BERKHORDAR KHAN and AMIR KHAN's diviſion, to prevent their taking him in flank, he advanced with ſeven battalions to attack DOONDY KHAN and HAFIZ RAHMUT KHAN's diviſion with fixed bayonets. The *Rohillas* received the charge with great reſolution; and the action was ſo cloſe, that they fought hand to hand. Near eight thouſand *Rohillas* were killed or wounded, and the attack became ſo hard upon them, that but few of the people remained with their chiefs; not above five hundred, or at moſt a thouſand with each, after the violence of the firſt charge.

HAFIZ RAHMUT KHAN being indiſpoſed, was in his *palankin*, and ſeeing the deſperate ſtate of affairs, he ordered his people to carry him to DOONDY KHAN, that he might expire in his preſence: while, on the other hand, DOONDY KHAN was giving orders to ſearch for HAFIZ RAHMUT KHAN; for ſo great was the confuſion, that no one knew where another was. The two battalions left to oppoſe the SHAH's flank diviſions, as mentioned above, exerted themſelves very much, and repulſed the *Durranies* as often as they attempted to advance. In this action, which

laſted three hours, ſix of IBRAHIM KHAN's battalions were almoſt entirely ruined, and he himſelf wounded in ſeveral places, with ſpears, and with a muſket-ball. AMAJEE GUICWAR, whoſe diviſion ſupported IBRAHIM KHAN, behaved very well, and was himſelf wounded in ſeveral places.

In the centre of the line, the BHOW with BISWAS ROW, and the houſehold troops, charged the diviſion of the Grand *Vizier*. The *Mahrattas* broke through a line of ten thouſand horſe, ſeven thouſand *Perſian* muſketeers, and one thouſand camels with *Zumburucks* upon them, killing and wounding about three thouſand of them. Among the killed was ATTAI KHAN, the Grand *Vizier*'s nephew, who had gained ſo much honour by the defeat of GOBIND PUNDIT. The diviſion gave ground a little, but the Grand *Vizier* himſelf ſtood firm, with three or four hundred horſe, and fifty *Zamburuck* camels: he himſelf, in complete armour, diſmounted to fight on foot.

The *Navab* SHUJA-UL-DOWLAH, whoſe diviſion was next, could not ſee what was going on, on account of the duſt, but finding the ſound of men and horſes in that quarter ſuddenly diminiſh, he ſent me to examine into the cauſe. I found the Grand *Vizier* in an agony of rage and deſpair, reproaching his men for quitting him. "Our country is far off, my friends," ſaid he, "whither do you fly?" But no one regarded his orders or exhortations. Seeing me, he ſaid, "Ride to my ſon "SHUJA-UL-DOWLAH, and tell him, that if he does not ſupport me immediately, "I muſt periſh." I returned with this meſſage to the *Navab*, who ſaid, that the enemy being ſo near, and likely to charge his diviſion, the worſt conſequences might follow to the whole army if he made any movement at that time, which might enable the enemy to paſs through the line.

The *Navab*'s diviſion conſiſted of only two thouſand horſe, one thouſand muſketeers, with twenty pieces of cannon, and ſome ſwivels: but they ſtood in cloſe order, and ſhowed ſo good a countenance that the enemy made no attempt upon it. Once or twice they advanced pretty near, and ſeemed as if they would charge us; but they did not.

On the left of the *Navab*'s diviſion was that of NUJEIB-UL-DOWLAH, who had about eight thouſand *Rohilla* infantry with him, and near ſix thouſand horſe. They advanced ſlowly under cover of a kind of breaſt-works of ſand, which were thrown up by a great number of *Bildars* who were with them, and who, having finiſhed one, advanced the diſtance of half a muſket-ſhot in front of that, under cover of their own people, and threw up another; to which the troops then advanced, while a third

a third was thrown up in the ſame manner. They had got on above a coſs in this method, and were within a long muſket-ſhot of the enemy, NUJEIB-UL-DOWLAH ſaying, " that it behoved him to exert himſelf, as he was the perſon moſt deeply " intereſted in the event of that day, the reſt being only as viſitors:" and, to ſay the truth, he was a man of ſurpriſing activity and ability.

He was oppoſed by JUNKOOJEE *Sindia*, and between them there was a mortal enmity. As the *Rohillas* had a great number of rockets with them, they fired volleys of two thouſand at a time, which, not only terrified the horſes by their dreadful noiſe, but did ſo much execution alſo, that the enemy could not advance to charge them. Beſides which, the diviſion of SHAH PUSSUND KHAN, was on the right flank of NUJEIB-UL-DOWLAH; and that *Durrany* chief, being a brave and experienced officer, advanced in ſuch good order, that the *Mahrattas* could make no impreſſion on it.

The action continued in nearly this ſtate from morning till noon, and, though we ſuffered leaſt in point of killed and wounded, yet, upon the whole, the *Mahrattas* ſeemed to have the advantage.

About noon the SHAH received advice that the *Rohillas* and the Grand *Vizier*'s diviſions had the worſt of the engagement; upon which he ſent for the *Neſuckchees* (a corps of horſe with particular arms and dreſs, who are always employed in carrying and executing the SHAH's immediate commands), and two thouſand of them being aſſembled, he ſent five hundred of them to his own camp, to drive out by force all armed people whom they ſhould find there, that they might aſſiſt in the action; and the remaining one thouſand five hundred, he ordered to meet the fugitives from the battle, and to kill every man who ſhould refuſe to return to the charge. This order they executed ſo effectually, that after killing a few, they compelled ſeven or eight thouſand men to return to the field. Some were alſo found in the camp, and ſome the SHAH ſent from the reſerve which was with him. Of theſe he ſent four thouſand to cover the right flank; and about ten thouſand were ſent to the ſupport of the Grand *Vizier*, with orders to charge the enemy ſword in hand, in cloſe order, and at full gallop. At the ſame time he gave directions to SHAH PUSSUND KHAN and NUJEIB-UL-DOWLAH, that, as often as the Grand *Vizier* ſhould charge the enemy, thoſe two chiefs ſhould at the ſame time attack them in flank,

About one o'clock theſe troops joined the Grand *Vizier*, who immediately mounted his horſe, and charged the body of the *Mahratta* army, where the BHOW commanded

manded in perſon: SHAH PUSSUND KHAN and NUJEIB-UL-DOWLAH took them in flank at the ſame time, which produced a terrible effect.

This cloſe and violent attack laſted for near an hour, during which time they fought on both ſides with ſpears, ſwords, battle axes, and even daggers. Between two and three o'clock, BISWAS ROW was wounded, and diſmounted from his horſe; which being reported to the BHOW, he ordered them to take him up and place him upon his elephant. The BHOW himſelf continued the action near half an hour longer on horſeback, at the head of his men; when all at once, as if by enchantment, the whole *Mahratta* army at once turned their backs and fled at full ſpeed, leaving the field of battle covered with heaps of dead. The inſtant they gave way, the victors purſued them with the utmoſt fury; and, as they gave no quarter, the ſlaughter is ſcarcely to be conceived, the purſuit continuing for ten or twelve coſs in every direction in which they fled.

Of every deſcription of people, men, women, and children, there were ſaid to be five hundred thouſand ſouls in the *Mahratta* camp, of whom the greateſt part were killed or taken priſoners: and of thoſe who eſcaped from the field of battle and the purſuit, many were deſtroyed by the *Zemindars* of the country. ANTAJEE MANKEESER, a chief of rank, was cut off by the *Zemindars* of *Ferocknagur*.

The plunder found in the *Mahratta* camp was prodigiouſly great: you might ſee one of our horſemen carrying off eight or ten camels, loaded with valuable effects: horſes were driven away in flocks like ſheep; and great numbers of elephants were alſo taken.

Near forty thouſand priſoners were taken alive; of which ſix or ſeven thouſand took ſhelter in the camp of SHUJA-UL-DOWLAH, who poſted his own people to protect them from the cruelty of the *Durranies:* but the unhappy priſoners, who fell into the hands of the latter, were moſt of them murdered in cold blood, the *Durranies* ſaying in jeſt, that, when they left their own country, their mothers, ſiſters, and wives, deſired that, whenever they ſhould defeat the unbelievers, they would kill a few of them on their account, that they alſo might poſſeſs a *merit in the ſight of* GOD. In this manner thouſands were deſtroyed, ſo that in the *Durrany* camp (with an exception of the SHAH and his principal officers) every tent had heads piled up before the door of it.

As ſoon as the battle was over, all the chief officers preſented their *Nezzurs* of congratulation to the SHAH; and his majeſty, having taken a ſlight view of the field of battle, returned to his tent, as all the other commanders did to theirs, leaving

ing the inferior officers and private ſoldiers to continue the plunder and purſuit at their own diſcretion.

Towards morning, ſome of BERKHORDAR KHAN's *Durranies* having found the body of BISWAS ROW, on his elephant, after taking the elephant and jewels, brought the body to SHUJA-UL-DOWLAH, who gave them two thouſand rupees for it, and ordered that it ſhould be taken care of. IBRAHIM KHAN GARDEE, though ſeverely wounded, had been taken alive by SHUJA KOULY KHAN, one of SHUJA-UL-DOWLAH's own people; which being reported to his Excellency, he ordered him to be carefully concealed, and his wounds to be dreſſed.

The SHAH next day ordered SHUJA-UL-DOWLAH to ſend the body of BISWAS ROW for him to look at; which he accordingly did. The whole camp, great and ſmall, were aſſembled round the SHAH's tent to ſee it; and every one was in admiration of the beauty of its appearance: it was not diſfigured by death, but looked rather like a perſon who ſleeps: he had one wound with a ſword on the back of his neck, and a ſlight one with an arrow over his left eye, but there was no blood diſcoverable on any part of his remaining clothes. Upon ſight of this body, many of the *Durranies* aſſembled in a tumultuous manner, ſaying, "This is the body of "the king of the unbelievers; we will have it dried and ſtuffed to carry back to "*Kabul*." Accordingly it was carried to the quarter of BERKHORDAR KHAN, and depoſited near the tent of MOOTY LOL, a *Kettery* by caſt, who was his *Dewan*.

As ſoon as SHUJA-UL-DOWLAH heard of this, he waited upon the SHAH, and joined with the Grand *Vizier*, repreſented to his majeſty, "that enmity ſhould be "limited to the life of our enemy; and it is always the cuſtom of *Hindoſtan*, that "after a victory, the bodies of the chiefs, of whatever race or tribe, are given up, "that they may receive their proper obſequies, according to the rules of their par-"ticular religion: ſuch conduct, they ſaid, does honour to the victors, but an op-"poſite one diſgraces them. Your majeſty is only here for a time, but SHUJA-UL-"DOWLAH, and the other *Hindoſtany* chiefs, are the fixed reſidents of this country, "and may have future tranſactions with the *Mahrattas*, when their conduct on the "preſent occaſion will be remembered; therefore let the body be given up to them, "that they may act as is cuſtomary here."

This matter remained in agitation for near two days, NUJEIB-UL-DOWLAH, and indeed all the *Hindoſtany* chiefs, joining in the ſame requeſt. I was alſo ſent on this account, accompanied by MEIG RAJ, the *Vakeel* of NUJEIB-UL-DOWLAH, to

the

the tents of BERKOHRDAR KHAN and MOOTY LOL. A ſecond time I went alone, when MOOTY LOL aſked me if I came on that buſineſs only, or would undertake any thing further: I ſaid, "for any thing that he choſe to communicate." Accordingly he carried me privately into two inner tents; in one I found *Raja* BABOO PUNDIT, the BHOW's *Vakeel*, who was wounded, with whom I converſed for ſome time; after which I went into the other tent, where ROW JUNKOOJEE *Sindia* was ſitting; he was wounded with a ball, and with a ſpear in the arm, which he wore in a ſling, and was a youth about twenty years of age. Upon ſeeing me he hung down his head; on obſerving which, I ſaid to him, "Why do you do ſo, Sir? "whatever could be expected from human valour and exertion, you have done; "and the deeds of that day will live for ever in the memory of mankind." Upon this, lifting up his head, he ſaid, "True, no one can contend with deſtiny. I wiſh "I had died in the field of battle; but it was my fate to be brought hither. Theſe "people now require ranſom from me, nor would it be difficult for me to pay what "they demand, but it is impoſſible for me to get it here at this time. You were a "friend of my father's, and there was always friendſhip between my family and the "*Navab*'s, and my father did them conſiderable ſervices: if his Excellency will pay "the money required for my releaſe, it is an obligation that I ſhall never forget." I aſſured him that the *Navab* would not be backward, and deſired to know how much was required. MOOTY LOL ſaid, ſeven lacks of rupees was the ſum mentioned, but that it might probably be ſettled for leſs. I immediately returned to the *Navab*, whom I found ſitting with NUJEIB-UL-DOWLAH; I told him all that had paſſed reſpecting the buſineſs he ſent me upon; but as I well knew the enmity which NUJEIB-UL-DOWLAH bore to the family and perſon of JUNKOOGEE, and thought, that from his good intelligence he might have ſome intimation that JUNKOOGEE was taken alive, I thought it beſt to avoid ſaying any thing about him to the *Navab* at that time, and went away to another part of the tent: but NUJEIB-UL-DOWLAH, who had obſerved me, ſaid to the *Navab*, "From the countenance "of CASI RAJA, I perceive he has ſomething elſe to ſay which my preſence pre-"vents." SHUJA-UL-DOWLAH replied, that there were no ſecrets between them two; and immediately calling me, made me ſwear by the *Ganges*, to ſpeak all that I ſhould have done if NUJEIB-UL-DOWLAH had not been there; which being thus compelled to do, I did. NUJEIB-UL-DOWLAH, who was maſter of the moſt profound diſſimulation, ſaid, that it was highly proper, and becoming great men, to relieve their enemies under ſuch circumſtances; he therefore begged that SHUJA-

UL-DOWLAH

UL-DOWLAH would ſettle the ranſom of JUNKOOJEE, and that he himſelf would pay half of it. This was his profeſſion; and ſoon after taking leave, he went to the Grand *Vizier*, and informed him of all the particulars.

As, on one hand, NUJEIB-UL-DOWLAH wiſhed to exterminate the family of *Sindia*, the Grand *Vizier* alſo was an enemy to BERKHORDAR KHAN, whom he hoped to injure by diſcovering this ſecret negociation: they therefore went immediately together to the SHAH, and laid the affair before him. His Majeſty ſent for BERKHORDAR KHAN, and queſtioned him about having concealed JUNKOOJEE; but he poſitively denied having any knowledge of it. The Grand *Vizier* then ſent for me to prove the fact; but even after that, BERKHORDAR KHAN perſiſted to deny it. Upon which the SHAH ordered his *Neſuckchees* to ſearch the tents of that chief. Thus driven to extremity, BERKHORDAR KHAN immediately diſpatched orders to his people to put both the priſoners to death, and bury them privately, before thoſe ſent by the SHAH ſhould arrive to look for them: which was done accordingly, and thus thoſe unhappy people loſt their lives.

IBRAHIM KHAN GARDEE had hitherto remained in SHUJA-UL-DOWLAH's camp, and it was his Excellency's intention to ſend him privately to *Lucnow*; but ſome of the SHAH's people getting information of this, informed his Majeſty of it, who ſent for his Excellency, and queſtioned him on the ſubject. He at firſt denied it, but at length the SHAH, by dint of perſuaſion and flattery, got him to confeſs it. Immediately (as had been preconcerted) a great number of *Durranies* ſurrounded the SHAH's tent, crying out, "IBRAHIM KHAN is our greateſt enemy, and has "been the deſtroyer of multitudes of our tribe; give him up to us, or let us know "who is his protector, that we may attack him." SHUJA-UL-DOWLAH put his hand upon his ſword, and ſaid, "Here he is:" and things were very near coming to extremity, when the Grand *Vizier* interfered, and taking SHUJA-UL-DOWLAH aſide, he entreated him to conſign IBRAHIM KHAN to his care for one week, promiſing to reſtore him ſafe at the end of that time. The *Navab* expreſſed ſome apprehenſion of intended treachery; but the Grand *Vizier* ſwearing on the *Koran* that no harm ſhould befal the priſoner, SHUJA-UL-DOWLAH ſent for IBRAHIM KHAN, and delivered him into the Grand *Vizier*'s hands.

The SHAH ordered him to be brought into his preſence, and inſultingly aſked him, "how a man of his courage came to be in ſuch a condition?" He anſwered, "that no man could command his deſtiny; that his maſter was killed, and himſelf "wounded and priſoner; but that, if he ſurvived, and his Majeſty would employ

"him

" him in his ſerviee, he was ready to ſhew the ſame zeal for him as he had done " for the BHOW." The SHAH gave him back in charge to the Grand *Vizier*, where he was treated with the greateſt cruelty; and, as it is ſaid, they ordered poiſon to be applied to his wounds, ſo that he died the ſeventh day after.

The day after the battle, the SHAH, ſuperbly dreſſed, rode round the field of battle, where he found thirty-two heaps of the ſlain of different numbers, moſt of them killed near each other, as they had fought; beſides theſe, the ditch of the BHOW's camp, and the jungles all round the neighbourhood of *Paniput*, were filled with bodies. The SHAH entered the town of *Paniput*, and, after viſiting the ſhrine of BOO ALLY KALINDER, he returned to his tents.

SHUJA-UL-DOWLAH took ſome hundreds of *Biſhties* with him to the field of battle, to waſh the bodies, and look for thoſe of the chiefs, eſpecially for that of the BHOW; and carried the *Mahratta Vakeels* SINADUR PUNDIT, and GUNNEISH PUNDIT, and other priſoners, who knew the perſons of all the chiefs, to aſſiſt him in finding them out. Accordingly they found the bodies of JESWUNT ROW POWAR, and the ſon of PALA JADOO, and many others.

The ſecond day, after the ſtricteſt ſearch had been made for the body of the BHOW, advice was brought that a body was laying about fifteen coſs from the field of battle, which appeared to be that of a chief: SHUJA-UL-DOWLAH immediately went to the place, and had the body waſhed: ſome pearls of the value of three or four hundred rupees each, being found near the body, confirmed the belief of its being that of a perſon of rank. The pearls the *Navab* gave to SINADUR PUNDIT the *Mahratta Vakeel*, who, as well as the reſt of the *Mahrattas* who came to find out the bodies burſt into tears, and declared this to be the body of the BHOW, which they diſcovered by ſeveral natural marks, which the BHOW was known to have about him. Firſt, a black ſpot about the ſize of a rupee on one of his thighs; ſecondly, a ſcar in his back, where he had been wounded with a *Kuttar* by MAZUFFER KHAN; and thirdly, in his foot the fortunate lines, called by the aſtrologers, *Puddum Mutch*. The body was that of a young man about thirty-five years old, and ſtrongly made; and as it was known that the BHOW every day made one thouſand two hundred proſtrations before the ſun, ſo were there the marks of ſuch a practice on the knees and hands of this corpſe.

While we were thus employed, I obſerved one of the *Durranies*, who ſtood at a diſtance and laughed; which I remarked to the *Navab*, and told him, that perhaps that man might know ſomething reſpecting the body. The *Navab* took him aſide,

aſide, and queſtioned him; to which he anſwered, "I ſaw this perſon ſeveral "times during the battle; he was extremely well mounted, and, in the courſe of "the action two of his horſes were killed under him; at laſt he received ſeveral "wounds, and was diſmounted from his third horſe. About this time the *Mah-* "*ratta* army fled on all ſides, yet this perſon ſeemed ſtill to preſerve his preſence "of mind. He was well dreſſed, and had many jewels on, and he retired with a "ſhort ſpear in his hand, and with a reſolute aſpect. I and ſome others purſued "him for the ſake of his jewels, and, having ſurrounded him, we aſked him if "he was ſome chief, or the BHOW himſelf: and told him not to be afraid, for "we would do him no harm, but carry him wherever he deſired. As he made "no reply one of my companions grew angry, and wounded him with a ſpear, "which he returned; upon which we killed him, and cut off his head, but not "without his wounding two or three of us: the head another perſon has got." This laſt circumſtance was not true, for the head was afterwards found with this very man.

The *Navab* carried the body, and that of SUNTAJEE NAJAH (which had forty cuts of ſwords upon it) to the camp, upon two elephants, and informed the SHAH of all the circumſtances.

The SHAH, in compliment to SHUJA-UL-DOWLAH, gave orders that theſe two bodies, together with the body of BISWAS ROW, ſhould be burnt, according to the cuſtom of their caſts; and ſent twenty of his *Neſuckchees* to attend, and prevent the *Durranies* from giving any interruption to the ceremony. His excellency gave the bodies in charge to me, and told me that I was of the ſame country and tribe, and therefore he deſired that I would burn them with the proper ceremonials; and he ſent *Rajah* ANUFGHIRE with the *Neſuckchees* to attend me. Accordingly I carried them to a ſpot between the SHAH's camp and the *Navab*'s, and, having waſhed them with *Ganges* water, and perfumed them with ſandal wood, I burnt them.

About two thouſand of the fugitives from the BHOW's camp, who had eſcaped from ſlaughter by SHUJA-UL-DOWLAH's protection, were preſent on this occaſion, and all were of opinion that the headleſs body was the BHOW's; but ſtill, the head not having been ſeen, there was ſome room for doubt. In the evening, after burning the bodies, we returned to camp. At night SHUJA-UL-DOWLAH went to the Grand *Vizier*, and told him what the *Durrany* had ſaid reſpecting the head. The *Vizier* ſent for the *Durrany* who belonged to BERKHORDAR KHAN, and told him not to fear being obliged to give up his plunder, that he ſhould keep it all if

he would confeſs where the head was. Upon this the *Durrany* brought it wrapped up in a cloth, and threw it down before the Grand *Vizier*. *Rajah* BABOO PUNDIT, the *Mahratta Vakeel*, being ſent for to look at the head, immediately ſaid, "This is the head of the BHOW: he was my maſter, and the care of this is a ſacred duty to me; let me beg that this head may be given to me, and that I may be permitted to burn it, according to the ceremonial of our religion." The Grand *Vizier* ſmiled at this requeſt, and gave the head to him, at the ſame time ſending ſome *Neſuckchees* with him for his protection. *Rajah* BABOO PUNDIT carried the head on the outſide of the camp, and burnt it; after which no man doubted that the BHOW was actually killed. And this concludes all that I perſonally know reſpecting this battle and the death of the BHOW.

I afterwards learned from other parts of the country, that MULHAR ROW, AMAJEE GUICKWAR, BETAL SHU DEO, and ſome other chiefs, fled from the battle and eſcaped. One of the BHOW's wives eſcaped on horſeback, and got ſafe to *Deig*, where *Rajah* SURJA MUL received her with great reſpect, gave her money, clothes, and a *palankin*, and ſent her with an eſcort to *Janſy*, whence ſhe got ſafe to the *Decan*.

SHUMSHERE BEHADER got to *Deig*, wounded; SURJA MUL had his wounds taken the greateſt care of, but he died ſoon after; and his tomb is at *Deig*.

The fifth day after the battle, the SHAH returned to *Dehly*, which he reached in four marches. He wiſhed to ſeize on the empire of *Hindoſtan*; but GOD diſapproved of this deſign.

After our return to *Dehly*, SHUJA-UL-DOWLAH ſent all the fugitives from the *Mahratta* camp, who had taken ſhelter with him, under a guard of his own troops, to the boundary of the *Jauts* dominions, where they were ſafe.

Eight days after this, by the pleaſure of GOD, all the *Durranies* mutinied in a body, and inſiſted on the diſcharge of their arrears for the two years paſt, and alſo that they ſhould immediately march back to *Kabul*. This confuſion laſted for ſome days, during which time the *Durranies* quarrelled with SHUJA-UL-DOWLAH's people, and threatened to attack his camp. His Excellency, highly provoked at this, went to the Grand *Vizier*, and aſked him, "if that was the treatment he was to experience after all the fine promiſes that had been made to him?" The *Vizier* aſſured him, that both the SHAH and himſelf had the higheſt reſpect and attention for his Excellency; but that the *Durranies* were out of all power of controul. "Then (ſaid the *Navab*), I ſee the value of your promiſe;" and got up to depart.

depart. The *Vizier* embraced him, ſaying, "We ſhall meet again;" but his Excellency made no reply.

As ſoon as he returned to his own camp, he conſulted with his friends; and all agreed that it was no longer adviſeable to remain with the SHAH's army. Accordingly in the afternoon he decamped, and marched fifteen coſs that night; and in this manner, by five forced marches, he got to *Mindy Gaut* on the *Ganges*. He was apprehenſive that the SHAH might be ſo provoked at the abruptneſs of his departure, as to order him to be purſued; but no ſuch ſtep was taken; and the *Navab* croſſed the *Ganges*, and returned with ſafety into his own dominions.

After this, we learned from the news-writers, the SHAH, finding it impoſſible to pacify his army by any other means, was obliged to give up his views in *Hindoſtan* and to return to *Kabul*; having received above forty lacks of rupees from NUJEIB-UL-DOWLAH for the aſſiſtance which he had given him.

Though this narrative is written from memory, and long ſince the events happened, I do not believe that I have omitted any circumſtance of importance; and thoſe who reflect upon theſe tranſactions, will believe that Providence made uſe of AHMED SHAH DURRANY, to humble the unbecoming pride and preſumption of the *Mahrattas*; for in the eyes of GOD pride is criminal.

NOTES.

P. 412. *inviting)* This meaſure of the BHOW's ſeems to have been merely a political artifice, to diſunite the *Hindoſtany* chiefs, by exciting in ſome of them a hope of a participating in his conqueſts; for the preceding conduct of the BHOW gives little reaſon to believe that, if the *Durranies* and *Rohillas* had been out of the queſtion, he would have allowed the exiſtence of any power in *Hindoſtan* but that of the *Mahrattas*.

P. 416. *children)* This is a compliment very common among eaſtern nations; and, like moſt of their other compliments, means nothing at all.

P. 417. *addreſs)* Of this they are extremely tenacious; and it is a thing ſo very particularly attended to in the eaſt, that thoſe who have occaſion to correſpond with the *Aſiaticks*, cannot be too well acquainted with every one's addreſs; for any deviation excites either diſguſt or ridicule.

P. 420. *Págáh)* The word *Pàgàh* has the ſame ſignification among the *Mahrattas* as *Risàlah* has among the *Perſians* and *Moguls*; and, being indefinite in the number of troops of which it conſiſts, may be rendered pretty fairly by our word *brigade*. I have known it applied to a command of three hundred horſe, and I have alſo known it uſed in the ſame ſenſe to deſcribe one of ſome thouſands of horſe and foot with artillery.

P. 421. *Pindarries)* The *Pindarries* are the freebooters of the *Mahratta* armies, and uſually as numerous as thoſe they account their regulars. They are mounted on ſmall but hardy horſes, and ſerve for plunder only. The chiefs under whom they engage, enter into certain articles of agreement with the chief commanding

commanding the *Mahratta* army, reſpecting the diviſion of plunder; and the *Pindarries* alſo have particular conditions, on which they ſerve under their chiefs. Their principal uſe is in laying waſte an enemy's country, or their own when invaded; which they do with great alacrity and effect: alſo in attacking the baggage and camp-followers of an enemy's army. Another thing, which makes them extremely uſeful to their own army, is, that every *Pindarry* has a pair of large bags on his ſaddle, which, after his day's excurſion, he in the evening brings into camp, filled with wheat, barley, rice, or ſome other uſeful grain, plundered from the villages, which is ſold in the bazar for ſomething below the market-price; ſo that ten thouſand *Pindarries* are at leaſt as uſeful to the ſupply of their own army as an equal number of *Bunneahs* with carriage-bullocks would be.

P. 421. *The troops)* This ſeems to have been the criſis of the BHOW's fortune: had he boldly attacked the SHAH while he was paſſing the *Jumna*, he would probably have totally defeated him.

Ibid. his camp.) Colonel DOWE ſays, that the BHOW occupied the lines formerly thrown up by MAHOMMED SHAH, and that the DURRANY SHAH poſted himſelf in the more fortunate camp of NADIR SHAH. KASSI RAJH does not notice this, but ſays that the BHOW dug a trench round his camp. The point however is of little conſequence.

P. 429. *January)* Colonel DOWE ſays, it was on the 20th, not the 6th of *Jemad-ul-Sani*. The reader may believe either, without any injury to the fact of the battle itſelf. Dates are exceedingly inaccurate in all oriental productions.

P. 430. *duſt.)* This may appear extraordinary to thoſe who have never ſeen a large army of horſe galloping about on a duſty plain, in a hot climate, but is a very natural and true deſcription to thoſe who have.

If I am not miſtaken, PLUTARCH mentions, as one of the moſt cruel ſufferings of CRASSUS's army, when defeated in *Parthia*, that the *Parthians* galloped round them continually, and almoſt ſuffocated the ſoldiers with duſt.

P. 431. *enmity.)* DATTEA JU PATEIL, the brother of JUNKOOGEE, had been killed the year before, in the battle of *Badelly*, againſt NUJEIB-UL-DOWLAH.

Ibid. orders) Theſe orders of AHMED SHAH evince much military knowledge: perhaps better can ſcarcely be imagined in the ſituation of affairs; and the ſucceſs was complete.

P. 432. *enchantment)* The *Mahratta* army fled in conſequence of the death of BISWAS ROW, their chief. This is always the caſe with *Aſiatick* armies.

Ibid. ſouls) This number ſeems very great, but any perſon acquainted with the multitude of followers in an *Indian* camp, will not diſbelieve it. Even in *Engliſh* camps in *India*, three followers to each fighting man, is conſidered as a moderate number.

Ibid. merit) This is looked upon as highly beneficial to the ſouls of the faithful; and almoſt a certain paſſport to paradiſe.

P. 434. *Ganges)* This is one of the many inſtances among this people, where abſurd ſuperſtition is brought in excuſe of lax morality. What the author adverts to is very common, both among *Hindoos* and *Muſſulmans*. It is rather an adjuration than any thing that might reaſonably be deemed obligatory (even though its object were innocent) on the perſon on whom it is involuntarily impoſed; and is uſually practiſed to make men betray ſecrets which they are bound in honour to conceal. He who wiſhes to diſcover the ſecret, ſays, "I adjure you by the *Ganges*, or the *Koran*, or your ſon's head." This the other pretends to conſider

conſider a ſufficient compulſion for him to betray his truſt: I ſay pretends, becauſe where the ſecret regards their own intereſt or ſafety, they are very far from allowing an equal force to the adjuration.

P. 436. *cruelty)* The cauſe of this extraordinary enmity to IBRAHIM KHAN, was his having fought on the ſide of the infidels againſt the true believers.

P. 438. *killed)* Notwithſtanding all this, however, in the year 1779, a man appeared, who called himſelf the BHOW, and from many circumſtances obtained credit for ſome time.

He came firſt to *Etaiva*, and made himſelf known to LALA BALGOBIND, a merchant with whom the BHOW had been on terms of friendſhip. BALGOBIND was ſo far perſuaded of his identity, that he treated and entertained him with great reſpect: but, though he brought many circumſtantial proofs that he was the BHOW, and his age, perſon, and ſeveral marks about his body, ſtrongly ſupported that belief, ſtill there appeared a difference in temper and manner, which excited doubt. BALGOBIND having expreſſed his wiſh to be ſatisfied reſpecting this, the perſon replied, that after the battle and purſuit, from which he eſcaped alive, though wounded, he fled to the hills of *Kámáóun*, where he lived five years among a fraternity of *Fakeirs*, conforming to all their auſterities; which muſt neceſſarily have made a great change in his manners. That after this, he had reſided ſome time in *Rohilcund*, and had travelled to many places in the diſguiſe of a *Byraghy fakeir*. "At length," ſaid he, "I am arrived here, and we muſt deviſe the beſt me-"thod for me to declare myſelf." BALGOBIND told him, that, as there were many *Mahrattas* at *Benares* to whom the BHOW was known, he had better firſt ſhew himſelf there. Accordingly he went to *Chutterkote*, in *Bondelcund*, from whence he wrote (as the BHOW) to MORJEE BHUT, RAMCHUND GOTKUR, and GUNNEISH BHUT, at *Benares*; informing them that he was arrived at *Chutterkote*, and deſiring them to come to him immediately.

Upon receipt of this letter, MORJEE BHUT, the ſon of RAMCHUND GOTKUR, and DOONDOO BHUT, who was an old ſervant of the BHOW, ſet out for *Chutterkote*, where they immediately waited upon the ſuppoſed BHOW, and had a long conference with him; after which they retired to a houſe in the town. Next day they waited upon him again, when, in the courſe of the converſation, the ſuppoſed BHOW told them, that as he had left many lacks of rupees, as a depoſit with them, before the battle of *Paniput*, he deſired that they would furniſh him with ſome money, to defray the expence of the rank which he meant to aſſert. On this they immediately got up, and went away; and from that time they began to circulate a report that this was not the BHOW, but an impoſtor. When he heard this, he reproached them with ingratitude, and told them that he would come to *Benares*, and eſtabliſh his claims upon them: they however perſiſted to deny them, and returned to *Benares*. The ſuppoſed BHOW followed them, and arriving at *Benares*, went to reſide at the houſe of DOONDOO BHUT, who all along acknowledged him. Here ſeveral *Mahrattas*, and other conſiderable inhabitants of that town went to ſee him, and were ſo far convinced of his identity, that they gave and lent him large ſums of money. Several of the *Mahrattas* alſo ate with him, in proof of their belief of his ſtory. But four or five of the principal merchants, whom he had aſſerted to be his debtors, would not viſit him; at which he was ſo much provoked, that he ſent word to MORJEE BHUT, RAMCHUNDER GOTKUR, and GUNNEISH BHUT, either to pay him what they owed him, by fair means, or that he would compel them by force: at the ſame time he began to raiſe ſome troops in the town, and ſoon got together ſome hundreds of the kind of ſoldiery procurable in every town of *Hindoſtan*. He alſo got a palkey, and two or three horſes for himſelf, with which cavalcade he uſed to come into the town, and paſs in terror round the houſes of his debtors, who were much alarmed leſt he ſhould ſeize upon them and carry them off.

Mr. THOMAS GRAHAM, who at this time was reſident on the part of the company at *Benares*, hearing

of

of theſe proceedings, inquired of ſeveral perſons of character, whether, in their opinion, this man was the BHOW or not; who all replied that he certainly was an impoſtor. While this inquiry was going on, it was diſcovered that DOONDOO BHUT, a confidential friend of the BHOW (as has been ſaid before) was carrying on ſome ſecret negociation with RAJA CHEYT SING, who had ſent him money at different times. Mr. GRAHAM was led to believe, from many circumſtances, that one object of this negociation was to have him deſtroyed, under cover of ſome popular inſurrection; the *Raja* having at that time conceived a jealouſy of him, on account of his knowledge in the affairs of that diſtrict, which the *Raja* wiſhed as much as poſſible to conceal. As the *Engliſh* were then at war with the *Mahrattas*, and RAJA CHEYT SING thought to be rather diſſatisfied with the government, Mr. GRAHAM was very naturally alarmed at this intelligence, and ſent a meſſage to the *Raja*, requeſting that he would explain himſelf. In reply, RAJA CHEYT SING aſſured him that he was perfectly ignorant of the matter in queſtion, and deſired that Mr. GRAHAM would ſend for the perſon himſelf and inquire. Mr. GRAHAM accordingly did ſend for him, but he peremptorily refuſed to come, with expreſſions of contempt for the reſident's authority.

Mr. GRAHAM having adviſed the *Raja* of this, and called upon him for aſſiſtance, as the perſon in whoſe hands the government of the country was, as to its police, the *Raja* immediately ſent the *Ameer* and *Cutwal* of *Benares* with a detachment of Sepoys, to ſeize upon the ſuppoſed BHOW, and confine him. They accordingly ſurrounded the houſe in which he reſided, and, after ſome little reſiſtance, they took him priſoner, and carried him to Mr. GRAHAM, who aſked him ſome queſtions; to which his anſwers were not ſatisfactory, and rather tending to confirm the ſuſpicions already conceived of RAJA CHEYT SING.

The ſuppoſed BHOW remained a priſoner in the Aumeins Cutcherry at *Benares*, till Mr. GRAHAM having conſulted the board at *Calcutta*, received their orders to ſend him to *Chunarghur*, and deliver him in charge to the commanding officer there; and they at the ſame time directed him to inquire particularly into the truth or falſehood of his ſtory. This perſon was accordingly confined at *Chunarghur*, where Mr. GRAHAM went ſeveral times, and ſent for the priſoner, whom he queſtioned particularly reſpecting his whole ſtory; the reſult of which was, his feeling ſome diſpoſition to credit his being the BHOW, and occaſionally aſſiſting him with money. Soon after, Mr. GRAHAM went to *Calcutta*, carrying with him an agent on the part of the ſuppoſed BHOW; but in a ſhort time after, he himſelf going to *Madras* as ſecretary to Sir EYRE COOTE, nothing was determined reſpecting that affair, and the unfortunate man remained a priſoner till *Auguſt*, 1781, when Mr. HASTINGS, the Governor General, came to *Benares*, and the troubles with RAJA CHEYT SING commenced. During the time of Mr. HASTINGS's reſidence at *Chunarghur*, he ſent for the priſoner, and, after hearing his ſtory, ordered him to be releaſed. The man returned to *Benares*, where he died ſoon after.

Among others, KASSI RAJH PUNDIT, the author of this book, being at *Benares*, when the ſuppoſed BHOW reſided there, went to ſee him, and ſaid (as BALGOBIND had done) that the perſon exactly reſembled the real BHOW, and that the marks upon him (the ſame as mentioned in his narrative of the battle of *Paniput*) exactly correſponded, but that the manner and temper were different.

Thus the affair ſtands at preſent a ſubject for unbounded conjectures; and the *Benares* BHOW will generally be claſſed with LAMBERT SIMNEL, PERKIN WARBECK, the *Ruſſian* DEMETRII, and many others whom ill ſucceſs has tranſmitted to poſterity as impoſtors, when better fortune in the precarious appeal to the ſword, would perhaps have ſtamped them the real much-injured heirs of their domains, reſtored by the hand of Heaven, to bleſs their ſubjects by the benign exerciſe of legitimate authority.

> "The vanquiſh'd rebel like a rebel dies:
> "The victor rebel plumes him on a throne."

This

This man had written a hiſtory of himſelf in the *Perſian* language, which he gave to Mr. THOMAS GRAHAM, who would have indulged me with the peruſal of it, but having left it behind him when he went to the coaſt with the late Sir EYRE COOTE, in a place not ſufficiently dry, it was unfortunately deſtroyed by vermin.

P. 438. SHUMSHERE.) This was the father of ALY BEHADER, now at *Muttra* (in 1790) with TOKOJEE HULKER.

Ibid. He wiſhed) This is the only hiſtorical intimation that I remember to have met with of this fact, yet it is extremely probable; and I was told by people of the firſt authority, when I was at *Dehly*, that the connection which AHMED SHAH DURRANY formed with the houſe of TIMUR when he was in *Hindoſtan*, was with that view. He himſelf married a daughter of MOHAMMED SHAH, and gave a young daughter of ALUMGHIRE SANI (conſequently a ſiſter or half-ſiſter of SHAH ALUM) to his ſon TIMUR SHAH, who has ſince ſucceeded him in the throne of *Kabul*, &c. But his conſtant apprehenſions on the ſide of *Perſia*, and a diſpoſition void of enterprife, have hitherto prevented TIMUR SHAH from attempting any thing in *Hindoſtan*; and, as he grows older, it is probable that his pacific conduct will ſtill continue.

P. 439. *Navab.)* It cannot fail to ſtrike every reader, that though KASSI RAJH PUNDIT was a ſervant, and evidently a great admirer of SHUJA-UL-DOWLAH, omitting no fair occaſion of praiſing him, yet he ſays nothing of what DOWE and ſome others tell us of SHUJA-UL-DOWLAH's being highly inſtrumental to gaining the victory at *Paniput*, by wheeling round upon the flank of the *Mahrattas*, at a critical part of the battle. On the contrary, by his very clear and minute detail, it appears that SHUJA-UL-DOWLAH's diviſion never moved from their firſt poſt, but thought themſelves fortunate in not being attacked where they were. As, independent of hiſtorical truth and his maſter's credit, KASSI RAJH would himſelf have derived ſome ſhare of reputation from the gallant actions performed by that diviſion, it does not ſeem likely that he would have paſſed ſuch a circumſtance over in ſilence, if it had ever happened.

AN EXPLANATION OF THE PLAN.

A. *Paniput*, with the *Mahratta* Camp.
1 Diviſion of IBRAHIM KHAN.
2 Diviſion of AMAJEE GWICKWAR.
3 Diviſion of SHU DEO PATUL.
4 Diviſion of the BHOW and BISWAS ROW.
5 Diviſion of JESWONT ROW.
6 Diviſion of SHUMSHERE BEHADER.
7 Diviſion of MULHAR ROW.
8 Diviſion of JUNKOOGEE *Sindia*.

B. The *Durrany* Camp.
C. *The* SHAH's *advanced Tent.*
1 Diviſion of BERKHORDAR KHAN.
2 Diviſion of AMIR BEG, &c.
3 Diviſion of DOONDY KHAN.
4 Diviſion of HAFIZ RAHMUT KHAN.
5 Diviſion of AHMED KHAN BUNGUSH.
6 Diviſion of the Grand *Vizier*.
7 Diviſion of SHUJA-UL-DOWLAH.
8 Diviſion of NUJEIB-UL-DOWLAH.
9 Diviſion of SHAH PUSSUND KHAN.
10 *Perſian* Muſketeers.

Remark by the PRESIDENT.

THE preceding narrative brings to my mind an anecdote, which I received from BAHMEN of *Yezd*, whoſe father BAHRAM had been a confidential ſervant of CARIM

CARI'M KHA'N, and heard it at *Shirâz* from the lips of the KHA'N himſelf. Both CARI'M *Zend* and AHMED *Abdáli* were officers of NA'DIR *Sháh*; and, having diſpleaſed him at the ſame time, for a little neglect of their duty as commiſſaries, were put under arreſt, and confined for ſome days in the ſame guard-room; but ſuch are the viciſſitudes of life in unſettled countries, that a ſhort time after, NA'DIR was aſſaſſinated by one of his own kinſmen; CARI'M became, at length, ſovereign of all *Irán*, where he reigned near thirty years univerſally beloved; and AHMED, having founded a new kingdom at *Kábul*, obtained the victory at *Pánipat'h*, without which the *Mahráttas* would, perhaps, at this day have been the moſt powerful nation of *India*.

TO COLONEL PEARSE.

DEAR SIR,

THE following is an extract from a paper written in 1782, and intended for a periodical mathematical publication, which I then had the care of: as it moſtly relates to a ſubject of which no perſon is a better judge than yourſelf, if you think it worthy of a place in the *Tranſactions* of the *Aſiatick Society*, I requeſt you will tranſmit it.

I am, dear Sir,

Your moſt obedient and

moſt humble ſervant,

Fort William,
June 10, 1787.

REUBEN BURROW.

VI.

A SPECIMEN OF A METHOD OF REDUCING PRACTICAL TABLES AND CALCULATIONS INTO MORE GENERAL AND COMPENDIOUS FORMS.

THOUGH practices uſual in one ſcience may often be transferred with advantage to another, yet the general claſs of writers are ſo much more intent upon making books than improvements, that it very ſeldom happens to be the caſe: and therefore, though the following hints can have little claim to ingenuity, they are certainly valuable on account of their uſe.

It

It is common in Aſtronomy, when there are two ſeries of quantities, whoſe reſpective terms depend on each other, to find a general expreſſion for an intermediate term, by what is called the method of interpolation: that is applied by NEWTON to *Comets*, and by DE LA CAILLE to *Eclipſes*; and I ſhall here, as a ſpecimen, apply it to ſome few examples in artillery and fortification.

Let g+hx be an expreſſion by which the quantity a is derived from m, and b from n; then if N is any term in the ſeries m, n, the term derived from it, in the ſeries a, b, will be (an-bm) : (n-m)+N (b-a) : (n-m).

In p. 174 of MULLER's Artillery, the length of a battery for two pieces of cannon is forty feet; and for four pieces, fifty-eight feet: now if N be the number of cannon, a general expreſſion for the length of the battery may be found, by ſubſtituting two for m, and four for n; forty for a, and fifty-eight for b, in the foregoing form, which then becomes 22+9 N; and therefore, for twenty pieces of cannon, the length of the battery is 202 feet.

By a ſimilar ſubſtitution, if fifty men are required to make the battery for two pieces, and ſeventy for that of four pieces, as in MULLER's Table; then 30+10 N, is the expreſſion for the men required for any number N of pieces in general.

Inſtead, therefore, of MULLER's Table, the following general one may be inſerted for the number of men, tools, &c. for making a battery for any number of cannon in one night.

Number of Pieces.	*Length of the Battery*	*Men to make the*		*Tools.*	*Faſcines in feet.*			*Pickets.*	*Mallets*	*Hand Bills.*	*Platforms.*			*Bavins.*
		Battery	*Faſcines.*		10	8	6				*Planks.*	*Sleepers*	*Pickets.*	
N	22+ 9N	30+10N	5+ 5N	40+15N	20+25N	20+14N	8N	180+205N	2+4N	8+2N	18N	5N	32N	25N

In the ſame manner, from having a few particular caſes in other kinds of rules, general ones may be found; for example, if N be a number whoſe r root is required; and if x^r be its neareſt complete power, then we know already, that

$x : N \backsim x :: x : N^{\frac{1}{r}} \backsim x$ for the one root.

$\frac{3}{2}x^2+\frac{1}{2}N : N \backsim x^2 :: x : N^{\frac{1}{2}} \backsim x$ for the ſquare root.

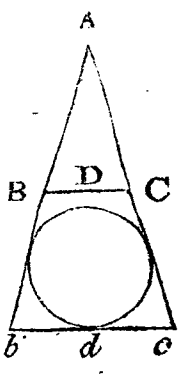
$2x^3+N : N \backsim x^3 :: x : N^{\frac{1}{3}} \backsim x$ for the cube root.

Now the general form of the three laſt terms is evident; and to find thoſe of the firſt term, let one and two be put for m and n; and one and three halves for a and b; and by ſubſtituting in the foregoing expreſſion, the general coefficient of x^r is found to be $(r+1)$; again if we put o and one half for a and b, we find the coefficient of N to be $(r-1)$.

If we uſe the ſecond and third proportions, putting two and three for m and n, and for a and b, three halves and two, in the firſt caſe; and one-half and one, in the ſecond we get the ſame values. Hence in general; $\frac{r+1}{2}x+\frac{r-1}{2}N : N^{r} \sim x :: x : N^{\frac{1}{r}} \sim x$.

Another example of the advantage of transferring practices from one ſubject to another is this. Dr. HALLEY has applied a method ſimilar to that of interpolation to find the time of the tropicks: now the ſun's meridian altitude may be found in the ſame way, from altitudes taken near the meridian, and if the obſerver begins a little before noon to take altitudes and the times, and continues to do ſo till a little after noon, a number of meridian altitudes may be deduced from theſe, and the latitude found much more exactly from them, than can be expected from a ſingle meridian altitude, by uſing the expreſſion for the maximum, or otherwiſe.

Analogous to theſe, are methods of generalizing properties from particular caſes: thus, if Ab Ac be tangents to a circle, and if any lines BC bc, be alſo drawn to touch the circle; then the perimeters of all the triangles A B C, will be conſtant, and alſo the difference between the ſum of Ab and Ac and the baſe bc: this property is of uncommon uſe in the conſtruction of problems, relative to plain triangles and trapeziums; and if lines be ſuppoſed drawn from the centre, or a point in the circumference of a ſphere, to each part of the figure, it will be found, that the projection of the figure upon the ſphere will have analogous properties, and that the theorem is alſo true in ſpherical triangles. By a little mode of conſideration, problems ſimilar to thoſe of APOLLONIUS on tangencies may be conſtructed on the ſphere: for inſtance, having three circles given upon a ſphere, a fourth may be found to touch them; for their poſitions on the ſphere being given, their projections will alſo be given on a plane ſtereographically; and as a circle may be found in VIETA's method to touch them on that plane, the ſituation of that circle may be found upon the ſphere, and hence properties may be found for conſtructing the



the problem independent of the ſtereographic projection: and if we ſuppoſe the centre of projection to be the centre of focus, &c. of a ſpheroid or other ſolid, innumerable properties may be found relative to their tangents, curvatures, &c. regard being had to the poſition of the plane, &c.

To give a ſpecimen of the aforeſaid method in fortification, let h (ſee pp. 22, 23, 24, and 25, of DEIDIER's *Perfect French Engineer*) repreſent the height of a wall; then, according to VAUBAN's meaſures, if five feet be the thickneſs at the top, $\frac{1}{3}h+5$ will be the thickneſs at the bottom; and, according to BELIDOR's method $\frac{1}{12}h+3{,}5$ will be the thickneſs at the top, and $\frac{1}{4}h+3{,}5$ that at the bottom. The length of the counterfort (according to VAUBAN) will be $\frac{2}{3}h+2$; alſo $\frac{1}{10}h+2$ is the thickneſs next the wall, and $(\frac{1}{5}h+4)$ the thickneſs at the other end of the counterfort. If part of the wall is gazoned, let e be the height of that part and h that of the wall; then $\frac{1}{3}(h+e)+5$ is the thickneſs at the bottom; $\frac{1}{3}e+5$, is the thickneſs at the top; $\frac{1}{3}(h+e)+2$ is the length of the counterfort; $\frac{1}{10}(h+e)+2$, its thickneſs next the wall, and $\frac{1}{3}(\frac{1}{3}(h+e)+4$ its thickneſs fartheſt from the wall. When there are cavaliers, let c be their height in feet; then $\frac{1}{10}(2e+c+50)$ is the thickneſs of the revêtement at the top, and $\frac{1}{10}(2h+2e+c+50)$ is the thickneſs at the bottom.

A DEMONSTRATION OF ONE OF THE HINDOO RULES OF ARITHMETICK.

By Mr. REUBEN BURROW

THE art of invention being in a great meaſure dependent on the doctrine of combinations; every additional improvement in the laſt muſt of conſequence be uſeful in the former; and as the following ancient rule for "*finding the ſum of all "the different permutations of a given numeral quantity, conſiſting of a given number "of places of figures,*" is not, I believe, extant in any *European* Author, and is beſides very ingenious; I take the liberty to inſert it, and alſo to add the demonſtration.

Rule. Place an Arithmetical progreſſion over the figures, beginning with unity at the unit's place, and increaſing by unity; divide the product of the terms of this progreſſion by the number of places of figures in the given quantity: multiply the

ſum

ſum of the figures in the given quantity by the quotient, and ſet down the product as often as there are places in the given quantity; removing it each repetition one place to the right hand, and the ſum of theſe lines is the ſum of all the permutations.

Example. Required the ſum of the different permutations of 893.

$\frac{1\times2\times3}{3}=2$; $(8+9+3)2=40$;

3	2	1	40	893
8	9	3	40	839
			40	983
				938
				389
				398
			4440	
				4440

DEMONSTRATION.

Firſt, it is evident that if all the permutations of any number of letters expreſſing figures be put down; and thoſe in the firſt place to the right hand be multiplied by unity; thoſe in the ſecond place by ten; thoſe in the third place by 100, and ſo on; then the ſum of all theſe will be the ſum of the permutations required.

Secondly, Suppoſing the different permutations to be put down one under another, it will really appear, from the manner in which permutations are generated, that all the letters occur an equal number of times in each perpendicular column; and alſo that the number of times of occurrence in the permutations of n letters, is equal to the permutations of n—1 letters; but the permutations of n—1 letters is equal to 1.2.3...(n—1) or $1\times2\times3$ carried to n—1 terms; and conſequently if there be n letters in the given number, each letter in the columns aforeſaid will occur 1.2.3... (n—1 times).

Thirdly, Let 1.2..(n—1)=m then,

m (a+b+c+..n) 1= ſum of numbers in the unit's place or firſt column.

m (a+b+c+..n) 10= ſum of numbers in the tens or ſecond column.

m (a+b+c+..n) 100=ditto third column.

m (a+b+c+..n) 100... to (n—1) Cyphers=ditto in the n column; and the ſum of theſe is evidently equal to

m (a+b+c+....n).(1+10+100+... to n terms); and putting for (1+10+100..n) its value 111...n, the expreſſion becomes

(1.2.

$(1.2.3..(n-1))+(a+b+c+..n)+(111...n)$; but $1.2.3...(n-1)$ is equal to $\frac{1.2.3...n}{n}$ and therefore the expreſſion for the ſum of all the permutations is $(\frac{1.2.3...n}{n}) \times (a+b+c+...n) \times (111...n)$, which is the Hindoo rule when the figures of the given number are all unlike.

Laſtly, It is evident that $1.2.3...n$ is the number of permutations of n different things; but if ſeveral ſets of figures are alike, as r figures of one kind, s figures of another, for inſtance; then let
$(1.2.3...n) : (1.2..r) \times (1.2...s)$, &c. the number of permutations in that caſe be called N; then the ſum of the permutations is
$N:n \times (a+b+c+...n) \times (111...n)$ in general.

Example. Required the ſum of the permutations of 11335?

$\frac{1.2\ 3.4.5}{1.2.1.2}=30$; $\frac{30}{5}=6$; $6\times 13=78$;

78
78
78
78
78

866658 the Sum required.

VII.

ON THE NICOBAR ISLES AND THE FRUIT OF THE MELLORI.

By NICOLAS FONTANA, *Eſq.*

THE ſouth-weſt monſoon having ſtrongly ſet in on the *Malabar* coaſt, it was deemed unſafe to remain there any longer: we therefore took our departure from *Mangalore* on the 20th of *May*, 1778, directing our courſe towards the gulph of *Bengal*; and in leſs than ten days, we came in ſight of the *Carnicobar* iſlands; the appearance of which, at ſeven or eight leagues diſtance, is much like a chain of mountains covered with woods: we anchored to the N. E. of one of them, in five fathoms

fathoms with a good ſandy bottom; ſupplied ourſelves with water and wood, and proceeded in queſt of the other *Nicobars* or *Nancaveris*, as they are called, ſituated between eight and nine degs. N. lat. to the northernmoſt point of the iſland of *Sumatra*. They were deſcried on the 4th of *June*, to the S. W. ½ W. at the diſtance of ten leagues: the poſition of three of thoſe iſlands forms one of the ſafeſt harbours in *India*, where ſhips of all ſizes may ride with the greateſt ſecurity, ſheltered from all winds, about half a mile from ſhore; with the additional advantage of two entrances, that may ſerve for getting in and out, both with a N. E. and S. W. monſoon, having a clear deep channel on each ſide.

In one of the bays formed within thoſe iſlands, we moored in twelve fathoms, and there remained until the S. W. monſoon was quite over, which was in the beginning of *September*. The largeſt of thoſe iſlands is called *Nancaveri* or *Nancowry*, about five or ſix leagues in circumference; and better inhabited than any of the other two. The ſecond is called *Soury* or *Chowry*, and the other *Tricùt*, all cloſely ſituated: about ten leagues to the N. E. of them is another called *Catchoul**.

Almoſt the whole of thoſe iſlands is uncultivated, though there are a number of large valleys that might be rendered very fruitful, with little trouble, the ſoil being naturally fertile, where the cocoa-nut, and all other tropical fruits, come ſpontaneouſly to the higheſt perfection, together with yams and ſweet potatoes, to obtain which it is only neceſſary to ſcratch the earth ſuperficially, and the ſeeds ſo planted come forth in a few days†.

The ſurrounding ſea abounds with exquiſite fiſh, ſhell-fiſh, as cockles and turtles; and a moſt ſplendid diſplay of beautiful ſhells of the rareſt ſort are to be met with on the ſhore. The birds' neſts ‡, ſo much eſteemed in *China*, are alſo to be found among the rocks: ambergris is likewiſe to be met with, but the inhabitants have learned a mode of adulterating it, and it is therefore ſeldom to be found in a

* In the year 1756, the *Daniſh* E. I. Company erected on one of theſe iſlands a houſe to ſerve as a factory, but on their failure, in the year 1758, it was evacuated. On the re-eſtabliſhment of the Company in 1768, another houſe was built on *Soury* Iſland, which was, in 1773, in like manner, ordered to be evacuated as uſeleſs to the Company's intereſts: three or four *European* miſſionaries, with a view of making proſelytes, remained behind, and have continued there ever ſince, but without effecting even the converſion of a ſingle perſon: they collect, however, cocoanut oil, ſhells, and other natural curioſities, which they ſend annually to their brethren at *Tranquebar*.

An exact plan of thoſe iſlands may be ſeen in the *Neptune Oriental*.

† *Tricut*, being the flatteſt of thoſe Iſlands, is divided amongſt the inhabitants of the other two, where they have their plantations of Cocoanut and *Areca* trees; theſe laſt being very abundant all over the iſlands.

‡ *Nidos hos, rupibus oceani orientalis affixos, parant hirundines marini, domeſticis multo majores, ex holothuriis mari innatantibus materiam decerpentis.* KOEMPF. *Amœn.*—p. 833.

genuine

genuine ſtate: if adulterated with any heterogeneous matter, ſuch as wax, or reſin, the mode of diſcovery is ſimply by placing a ſmall bit of it upon the point of a knife when hot, and if it evaporates without leaving any calx or *Caput Mortuum*, and diffuſes a ſtrong fragrant ſmell, it is certainly genuine.

The inhabitants of the *Nicobar* iſlands are of a copper colour with ſmall eyes obliquely cut, what in ours is white being in theirs yellowiſh; with ſmall flat noſes, large mouths, thick lips, and black teeth; well proportioned in their bodies, rather ſhort than tall, and with large ears, in the lobes of which are holes, into which a man's thumb might be introduced with eaſe: they have black ſtrong hair, cut round; the men have little or no beard; the hinder part of their head is much flatter and compreſſed than ours; they never cut their nails, but they ſhave their eye-brows*. A long narrow cloth, made of the bark of a tree, round their waiſt and between their thighs, with one extremity hanging down behind†, is all their dreſs. The women and men are of the ſame copper colour, and very ſmall in ſtature; a bit of cloth made with the threads of the bark of the cocoa-nut tree faſtened to the middle and reaching half way down the thigh, forms all the covering of the women. Both ſexes are, however, very fond of dreſs; and when the men go into the preſence of ſtrangers, they put on hats and old clothes, that had been given them by *Europeans*; but among themſelves they are almoſt naked.

They live in huts, made of cocoa-nut leaves of an oval form, ſupported on bamboos, about five or ſix feet high from the ground; the entrance into the huts is by a ladder; the floor is made partly of planks, and partly of ſplit bamboos. Oppoſite to the door, in the furthermoſt part of the hut, they light their fire and cook their victuals; ſix or eight people generally occupy one hut, and a number of ſkulls of wild boars forms the moſt valuable article of furniture.

* It is a cuſtom among them to compreſs with their hands the occiput of the new-born child, in order to render it flat; as, according to their ideas, this kind of ſhape conſtitutes a mark of beauty, and is univerſally eſteemed ſuch by them: by this method, alſo, they ſay that the hair remains cloſe to the head, as nature intended it, and the upper fore teeth very prominent out of the mouth.

† A traveller called KROPING, a *Swede*, who went to the *Eaſt Indies*, on board a *Dutch* ſhip in the year 1647, which anchored off the *Nicobar* Iſlands, relates that they diſcovered men with tails, like thoſe of cats, and which they moved in the ſame manner. That having ſent a boat on ſhore with five men, who did not return at night, as expected, the day following a larger boat was ſent, well manned, in queſt of their companions, who, it was ſuppoſed, had been devoured by the ſavages, their bones having been found ſtrewed on the ſhore, the boat taken to pieces, and the iron of it carried away.

The account of this voyage was reprinted at *Stockholm* by SILVIUM in the year 1743—LINNÆUS ſeems to have been too credulous, in believing this man's ſtory, for in all my examinations, I could diſcover no ſort of projection whatever on the *os Cocygis* of either ſex. What has given riſe to this ſuppoſed tail, may have been the ſtripe of cloth hanging down from their poſteriors; which when viewed at a diſtance, might probably have been miſtaken for a tail.

The

The occupation of the men conſiſts in building and repairing their huts, which affords them an annual employment for ſix months at leaſt, and in fiſhing and trading to the neighbouring iſlands. The women are employed in preparing the victuals and cultivating the ground, they alſo paddle in the canoes, when the men go out. They unite in matrimony through choice; and, if the man is not ſatisfied with the conduct of the woman, either from her inattention to domeſtic concerns, or ſterility, or even from any diſlike on his part, he is at liberty to diſcharge her, and each unites with a different perſon, as if no ſuch connection had taken place. Adultery is accounted highly ignominious and diſgraceful; particularly with perſons not of the ſame caſt: ſhould it be proved, the woman would not only be diſmiſſed with infamy, but, on ſome occaſions, even put to death; although by the intervention of a ſmall token given publickly, and conſiſting of nothing more than a leaf of tobacco, the reciprocal *lending of their wives of the ſame caſt* is exceedingly common.

A woman who bears three children, is reckoned very fruitful; few bear more than four; the cauſe may be attributed to the men, from a debility occaſioned by the early intruſion of the teſticles into the abdomen, the hard compreſſion of them and the penis, by the bandage round thoſe parts, from premature venery, and hebetation brought on by the immoderate uſe of ſpirits; and from the very inactive and ſedentary life thoſe people lead, it will not be difficult to account for that want of longevity, which ſeems to prevail much in thoſe iſlands, more eſpecially amongſt the men, where none were to be ſeen older than forty or forty-eight years. The women, on the contrary, ſeem to live much longer.

They are themſelves ſo ſenſible of the ſcanty population of their iſlands, that they ſtudy to increaſe it by inviting, and even ſeducing, ſome *Malabars* or *Bengaleſe* to remain amongſt them, when brought thither by the country ſhips, and of whom there are in almoſt all villages ſome to be found, who may be eaſily diſcerned from the natives by their figure, features, colour, and language. The natives encourage their ſtay by grants of land with plantations of cocoatrees and arecas, and, after a certain number of years, they are permitted to make choice of a female companion.

Their indolence is not to be equalled by any other people of the eaſt. They go out a-fiſhing in their canoes at night; and with harpoons, which they dart very dexterouſly at the fiſh, after having allured them into ſhallow water with burning ſtraw, a ſufficient number is ſoon caught to ſerve the family for a meal: they immediately

mediately return home; and if, by chance, they catch a very large fiſh, they will readily diſpoſe of one half, and keep the remainder for their own uſe.

They entertain the higheſt opinion of ſuch as are able to read and write: they believe, that all *Europeans*, by this qualification only, are able to perform acts more than human, that the power of divination, controlling the winds and ſtorms, and directing the appearance of the planets, is entirely at our command.

This people, like other ſavage nations, dread the evil genius; ſome among them give themſelves the air of divination, and preſume to have ſecret confabulations with him: ſuperſtition muſt ever be in its full dominion, where ignorance is ſo groſs.

Some of the natives, having begun to fabricate earthen pots, ſoon after died; and the cauſe being attributed to this employment, it has never been reſumed; ſince they prefer going fifteen or twenty leagues to provide them, rather than expoſe themſelves to an undertaking attended, in their opinion, with ſuch dangerous conſequences.

Whenever they viſit one another, no ſort of compliment or ſalutation takes place between them; but when the viſitors take leave, they are profuſe in good wiſhes, that laſt for ſome minutes, with different inflections of voice, to which the other conſtantly anſwers, by repeating the words *Callá callá condì condì quiagé*, which may be rendered in *Engliſh* thus: "Very well, very well, go, go and return ſoon."

Behind, or cloſe by, their huts the dead are buried; all the relations and acquaintance cry for ſome hours before the corpſe is put into the grave, where it is interred with all poſſible ſolemnity, and in the beſt dreſs they can muſter, and with abundance of food. After the body is covered with earth, a poſt is raiſed and fixed in the ground over the head of the deceaſed, about four feet high, to the top of which they ſuſpend ſtrips of cloth with meal and areca nuts, and ſtrew cocoa-nuts all around. This ſupply of food for the deceaſed is even after continued; a cocoa tree is alſo cut down for every perſon that dies. As ſoon as a man is dead, his name is never mentioned, even if repeatedly aſked: every one of the mourning viſitors brings a large pot of toddy. The women ſit round the corpſe howling and crying, and by turns they go and put their hands on the breaſt and belly of the deceaſed, who is covered with ſtriped cloth: the men are ſeated at a little diſtance, drinking, and inviting all the viſitors to do the ſame; endeavouring thus to diſpel their grief, by a complete general intoxication, which never laſts leſs than a couple of days after the interment.

The different changes of the moon are productive of great feſtivity and mirth among the *Nicobarians*, when the doors of their huts are decorated with branches of palms and other trees: the inſide is alſo adorned with feſtoons made of ſlips of plantain leaves. Their bodies are, in like manner, decorated with the ſame ornaments; and the day is ſpent in ſinging, and dancing, and eating, and drinking toddy, till they are quite ſtupified.

The idea of years, and months, and days, is unknown to them, as they reckon by moons only, of which they number fourteen, ſeven to each monſoon. At the fair ſeaſon, or the beginning of the N. E. monſoon, they ſail in large canoes to the *Car Nicobars*, called by them *Champaloon*. The object of this voyage is trade; and for cloth, ſilver coin, iron, tobacco, and ſome other articles, which they obtain from *Europeans*, together with fowls, hogs, cocoa, and areca nuts, the produce of their own iſland, they receive in exchange, canoes, ſpears, ambergris, birds' neſts, tortoiſe-ſhell, and ſo forth.

Ten or twelve huts form a village. The number of inhabitants on any one of theſe iſlands does not exceed ſeven or eight hundred. Every village has its *Head Man*, or *Captain*, as they term him, who is generally the oldeſt. Few diſeaſes are known amongſt them; and the venereal not at all: the ſmall-pox viſits them occaſionally, but not of the confluent kind: what is more prevalent amongſt them, is the œdematous ſwelling of one or both of the legs, known in the weſt of *India* under the name of the *Cochin Leg*, from the place where this diſorder generally prevails. This endemial diſeaſe may be imputed to the following cauſes; ill choſen and badly prepared diet; the bad choice of habitations; and an extremely indolent, inactive life. Fevers and cholicks are alſo frequent among them: when a perſon falls ſick, he is immediately removed to the houſe of one of their prieſts, or conjurers, who orders the patient to be laid in a ſupine poſture for ſome time; then friction with ſome oily ſubſtance is applied to the upper part of the body, and often repeated; which remedy they indiſcriminately uſe for all complaints, never adminiſtering medicines internally.

The only quadrupeds on theſe iſlands are hogs and dogs: of the former, however, only the ſows are kept, and they are fed principally with the milk of the cocoa-nut and its kernel, which renders the meat of a firmneſs and delicious taſte, even ſuperiour, both in colour and flavour, to the beſt *Engliſh* veal. It may be worthy remark, that, although the neighbouring *Car Nicobar* woods abound with monkeys of different ſpecies, none are to be ſeen in theſe iſlands, notwithſtanding their

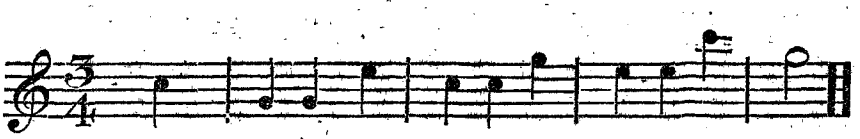
their having been repeatedly brought over: they neither propagate, nor do they live for any time.

Among the feathered tribe wild pigeons are pretty abundant from *June* to *September*, on account of a berry which is then ripe, and on which they feed with great eagerneſs: at the ſame time pheaſants and turtle doves are frequently found. The conſtant inhabitants of the woods are a ſpecies of the green parrot, or parroquet, with a black bill and collar: no other birds are to be found in them.

The climate is pure, and might, with little trouble, be rendered very ſalubrious: conſtant ſea breezes fan their ſhores, thus preſerving them from oppreſſive heat: vegetation continues without intermiſſion, the woods are very thick, and the trees bound together by a kind of twig or creeping ſhrub, that renders them almoſt impervious.

The *Nicobar* dance is as dull and inanimate as can be conceived, as well for the ſlowneſs and heavineſs of its motions, as for the plaintive monotonous tune that accompanies it; with no inſtrument but their mournful low voices, which are in perfect uniſon with the motion of their bodies. Men and women form a circle, by putting their hand on each other's ſhoulders; they move ſlowly, backwards and forwards, inclining ſometimes to the right, and ſometimes to the left.

The whole of their muſick conſiſts of the few following notes.



The baſis of the language ſpoken by theſe iſlanders is chiefly *Malay*, with ſome words borrowed from *Europeans*, and other ſtrangers, as will appear by the following ſpecimen:

Chia	Father	*Chegnoun*	Child
Cioum	Grandfather	*Choi*	Head
Chia Enchāna	Mother	*Lal*	Forehead
Ochiá	Uncle	*Moha*	Noſe
Encognee	Man	*Holmat*	Eyes
Covon	Son	*Manonge*	Lips
Encáná	Woman	*Caleta*	Tongue
Cance	Wife	*Incaougn*	Chin

Nann

Nann	Ears
Enchojon	Hairs
Halikolala	Neck
Thà	Breaſt
Vhian	Belly
Foún	Navel
Choal	Arm
Eckait	Shoulders
Och	Back
Kinitay	Hand and fingers
Poto	Thigh
Colcanon	Knee
Hanhan	Leg
Ciſcoa	Nail
Hignoughn	Beard
Tohon	Sick
Lha-ha	Dead
Hivi	Devil
Hen	Sun
Chae	Moon
Háyi	Wind
Onijo	Water
Gnam	Calm
Tenfagi	Day-light
Sciafin	Evening
Hatahom	Night
Kamhen	Noon
Menzovi	Yeſterday
Holactas	To-morrow
Charou	Great
Mombèſchi	Small
Koan	Strong
At'loan	Weak
Jo	Yes
At chiou	No

Lapoa	Is good
Piſi	Is enough
Thiou	Me or I
Mhihe	You
Kalakala younde	Farewel
Emloum	Gold
Henoe	Fire
Dheah	Water
Lhoe	Cloth
Lanoa	A ſtrip they wear
Gni	Houſe
Tanop	Pipe
Carrovaj	Lemon
Hoat	Old Cocoa-nut
Gninoo	Green Cocoa-nut
Nat	Cane
Pantan	Rattan
Aptejo	Cheſt
Cerum	Needle
Hendel	Muſket
Henathoa	Knife
Danon	Medicine
Heja	Betel nut
Achæ	Betel leaf
Cion	Lime
Chapeo	Hat
Lenzo	Handkerchief

* * * Theſe two laſt words are borrowed from the *Portugueſe*

Hanchan Chapeo	Put on your hat
Not	A hog
Ham	A dog
Cochin	A cat
Taffoach	Hen

Ohia

Ohia	Egg	*Pouſhili*	To ſet down
Inlegne	Birds neſt	*Hahahon*	To vomit
Cattoch	Parrot	*Achicienga*	To ſtand
Cha	Fiſh	*Hichiackeri*	To ſpeak
Cap	Tortoiſeſhell	*Athe het*	To write
Hanino	To eat	*Ajouhy*	To light
Peoum	To drink	*Luva*	Lead
Etaja	To ſleep	*Carán*	Iron
Ha-caou	To buy	*Chánlo*	Shirt and coat
Hen vhej	To ſell	*Hănhă*	Breeches
Laam	To lay down	*Hanho lola*	Stockings
Hancihatena	Come hither	*Dhanapola*	Shoes
Ciou	Be gone	*Halhat*	Bracelet
Hethaj	To laugh	*Henpòjou*	Chair
Houm	To weep	*Cheráchà*	Table
Hanan	To dance	*Pará*	Dollar, or ſilver
Hame	To rain	*Thanula*	Black
Pheumhoj	To ſmoke	*Chunla*	Red
Hanſciounga	To walk	*Unat*	White
Duonde	To paddle or row	*Cambalamagn*	Striped cloth

NUMERALS.

Heàn	One	*Eancata*	Nine
Haà	Two	*Sicom*	Ten
Loe	Three	*Sicom hean*	Eleven
Toan	Four	*Sicom hàa*	Twelve
Tanèe	Five	*Hemon thouma*	Twenty
Tafoul	Six	*Rocate*	Thirty
Iſat	Seven	*Toanmoan thiuma*	Forty
Enfoan	Eight	*Sicom ſicom*	Hundred

It ſeems that they have no expreſſion for the numbers beyond forty, except by multiplication.

Trees of great height and ſize are to be ſeen in their woods of a compact texture,

ture, well calculated for naval conſtructions*: but the productions of which they are more particularly careful, are the cocoa and *areca* trees, the laſt being chiefly for their own conſumption; as they chew it all day long with tobacco, betel-leaf, and ſhell-lime: the former is not only uſeful for their own and their hogs' nouriſhment, but alſo an object of trade. Moſt of the country ſhips that are bound to *Pegu*, from either of the coaſts of *India*, touch at the *Nicobar* Iſlands, in order to procure a cargo of cocoa-nuts, which they purchace at the rate of four for a tobacco-leaf, and one hundred for a yard of blue cloth, and a bottle of cocoa-nut oil for four leaves of tobacco. The tropical fruits grow in thoſe iſlands exquiſitely flavoured, the pine-apple in particular: wild cinnamon and ſaſſafras grow there alſo; the coffee-tree in two years yields fruit; yams are to be found for three or four months in the year only, and are eaten by the natives inſtead of the *Larum*, a nutritive fruit; in the deſcription of which, and the tree that produces it, we ſhall here endeavour to be very particular.

The tree, that bears this nutritive fruit, is a ſpecies of *Palm*, called by them *Larum*, by the *Portugueſe Mellóri*; and is very abundant in thoſe iſlands, as well as in *Carnicobar:* it grows promiſcuouſly in the woods among other trees, but it delights more particularly in a damp ſoil. The trunk is often ſtraight, thirty or thirty-five feet high, and ten or twelve inches (the oldeſt even two feet) in circumference: the bark is ſmooth, aſh-coloured, with equidiſtant interſections, of a compact hard texture in its interior part, but ſoft and quite hollow in the centre from the top of the trunk; the leaves grow diſpoſed like a calyx about three feet long and four inches broad, enſiform and aculeate, of a dark green hue, and of a tenacious hard ſubſtance: the roots are out of the ground, and inſerted at eight or ten feet on the trunk, according to its age, being not quite two feet in the earth: the fruit, which has the ſhape of a pine, and the ſize of a large *Jaca*, comes out of the bottom of the leaves: the age of a man is ſeldom ſufficient to ſee the trees bearing fruit: its weight forces it out of the leaves, and, when it is nearly ripe, which is known by the natives on the change of its colour from green to yellowiſh, it is gathered, and weighs from thirty to forty pounds. The drupes are looſened by thruſting a piece of iron between their interſtices: the exterior ſurface is cut off, and thus put into earthen pots covered with leaves, then boiled on a ſlow fire for ſeveral hours together: the fruit is ſufficiently boiled, when the medullary part of

* One of theſe trees our people cut down, that meaſured nine fathoms in circumference, or fifty-four feet.

it

it becomes ſoft and friable; it is then taken from the fire and expoſed to the cold air: when cold, the drupes are ſeparated from the ſtalk, and the medullary part preſſed out by means of a ſhell forced into them. Within the woody part of the drupes, there are two ſeeds, in ſhape and taſte much like almonds: the ſoft part is then collected into a ſpherical maſs, and, in order to extract all the ſtringy fragments remaining in it by the compreſſion of the ſhell, a thread is paſſed and repaſſed, until the whole is extracted, and it comes out perfectly clean: it is then of a pale yellow colour, much reſembling *polenta*, or the dreſſed meal of the *Zea Mays*, and in taſte much like it: when not newly prepared, it has an acidity, to which it tends very ſtrongly, if long expoſed to the atmoſphere; but it may be preſerved a long time, if well covered.

It is certain, that the *Nicobar* bread-fruit tree differs very eſſentially from the palm deſcribed by Mr. MASSON, and found in the interior parts of *Africa*, which bears a ſort of bread-fruit. On my ſhowing to Mr. MASSON, in *March*, 1790, the drawing of the tree here deſcribed, he was pleaſingly ſurprized at the novelty, and declared he had never before ſeen it. It differs alſo from the bread-tree found in *Otaheite*, and deſcribed by Captain COOK in his Voyage round the World, as will appear very evident on a reference to the notes of that work. Some ſhrubs, whoſe leaves reſemble much thoſe of the *Nicobar* bread-fruit tree, are to be ſeen on the *Coromandel* Coaſt, and in the iſle of France, where they thrive in ſome degree, but never attain the height of thoſe at *Nicobar*: imperfect ſmall fruits are ſeen once a year ſprouting out, and the inhabitants derive an advantage from the leaves of the tree, which they convert into mats and bags to hold coffee.

[For Note and Plate—*See the Works of Sir William Jones, Vol. II. p. 37.*]

NOTE on Page 450.

Though little can be added to M. POIVRE's deſcription of the *Salangane*, or *Hirundo, nidis edulibus*, yet, as Captain FORREST was a perfect maſter of the *Malay* tongue, and deſcribed only what he had ſeen, it will not be amiſs to ſubjoin his account of that ſingular bird. "The bird with an edible neſt is called, ſays he, *Jai-*
"*maláni* by the natives of the *Moluccas*, and *Layang-layang* by the *Malays*: it is
"black as jet, and very much like a marten, but conſiderably ſmaller. Its neſts,
"which the *Malays* call *Sarang*, are found in caves, and generally in thoſe to which
"the

"the ſea has acceſs: and, as they are built in rows on perpendicular rocks, from "which the young birds frequently fall, thoſe caves are frequented by fiſh, and "often by ſnakes, who are hunting for prey: they are made of a ſlimy gelatinous "ſubſtance found on the ſhore, of the ſea-weed called *agal agal*, and of a ſoft "greeniſh ſizy matter often ſeen on rocks in the ſhade when the water oozes from "above. Before a man enters ſuch a cave, he ſhould frighten out the birds, or "keep his face covered. The *Jaimaláni* lays her eggs four times a year, but only "two at a time: if her neſt be not torn from the rock, ſhe will uſe it once more, "but it then becomes dirty and black: a neſt, uſed but once before it is gathered, "muſt be dried in the ſhade, ſince it eaſily abſorbs moiſture, and, if expoſed to the "ſun, becomes red. Such edible neſts are ſometimes found in caves, which the ſea "never enters, but they are always of a dark hue, inſtead of being, like that now "produced, very nearly pellucid: they may be met with in rocky iſlands over the "whole eaſtern Archipelago (by far the largeſt in the world), but never, I believe, "on the coaſt of China, whither multitudes of them are carried from *Batavia*. "The white and tranſparent neſts are highly eſteemed, and ſold at *Batavia* for ſeven, "eight, nine, or ten dollars a catty of 1⅓lb. but the crafty *Chineſe* at that port, who "pack up the neſts, one in another to the length of a foot or eighteen inches, that "they may not eaſily be broken, ſeldom fail, by a variety of artifices, to impoſe on "their employers."

VIII.

ON THE MYSTICAL POETRY OF THE PERSIANS AND HINDUS.—*See the Works of Sir William Jones, Vol. I. p.* 445.

GITAGOVINDA; OR, THE SONGS OF JAYADE'VA.—*See the Works of Sir William Jones, Vol. I. p.* 463.

NOTE

NOTE *on* p. 316, Vol. I. *Sir William Jones's Works.*

By the PRESIDENT.

A desire of translating the couplets of VARA'HAMIHIRA with minute exactness, and of avoiding the *Sanscrit* word *ayana* in an *English* phrase, has occasioned a little inaccuracy, or at least ambiguity, in the version of two very important lines, which may easily be corrected by twice reading *ádyát* in the *fifth* case for *ádyam* in the first: so that they may thus be translated word for word: " Certainly the southern " road of the sun was, *or began*, once from the middle of *Aslésha*; the northern, " from the first of *Dhanisht'há*. At present the *southern* road of the sun *begins* from " the first of *Carcata*; and the other from the first of *Mriga*, or *Macar*."

IX.

ON THE INDIAN CYCLE OF SIXTY YEARS.

By SAMUEL DAVIS, *Esq.*

IN the Philosophical Transactions published for 1790, there is an account given of the *Hindu* cycle of sixty*, which being in many particulars deficient, and in some erroneous, I shall endeavour to shew the true nature and computation of that cycle, from the explanation which is given of it by the *Hindus* themselves.

The following two *slócas*, extracted from the last section of the *Súrya Siddhánta*, enumerate the several distinctions of time in astronomical use among the *Hindus:*

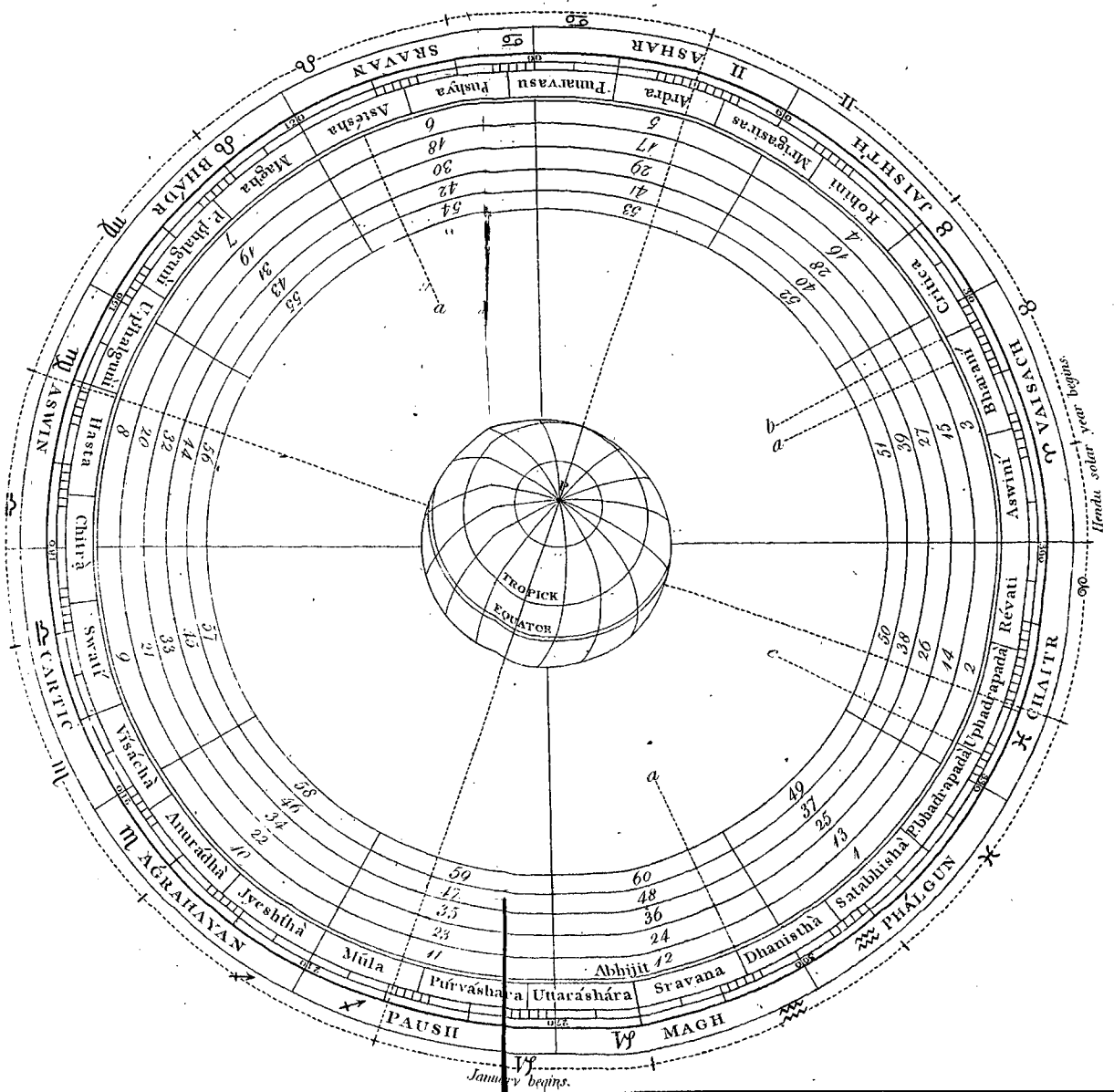
ব্রাহ্মং দৈবং তথা পিত্র্যং প্রাজাপত্যং গুরোস্তথা ।
সৌরং চ সাবনং চান্দ্রং আর্ক্ষং মানানি বৈ নব ॥
চতুর্ভির্ব্যবহারোত্র সৌর চান্দ্রার্ক্ষ সাবনৈঃ ।
বার্হস্পত্যেন ষষ্ট্যব্দং জ্ঞেয়ং নান্যৈস্তু নিত্যশঃ ॥

* " In their current transactions, the inhabitants of the peninsula employ a mode of computation, which, though " not unknown in other parts of the world, is confined to these [the southern] people amongst the *Hindoos*. This is a " cycle or revolving period of sixty *solar years*, which has no further correspondence with the æras above mentioned [of " *Bikramajit* and *Salahan*] than that of their years respectively on *the same day*." &c.

PHIL. TRANS. VOL. LXXX. Part ii.

Bráhman

THE HINDU ECLIPTICK.



Bráhman daivan tat'hà pitryan prájápatyan guróſtat'hà,
Sauran che ſávanan chándram árcſhan mánáni vai nava:
Chaturbhir vyavahâró'tra ſaurachándrárcſha ſávanaih,
Várhaſpatyéna ſhaſh'tyabdan jneyan nányaiſtunityas'ah:

and the tranſlation of them is as follows: "The *Bráhma*, the *Daiva*, the *Pitrya*, "the *Prájapatya*, that of *Guru*, the *Saura*, the *Sávana*, the *Chándra*, the *Nác-* "*ſhatra*, are the nine diſtinctions of time. Four of thoſe diſtinctions are of prac- "tical uſe to mortals; namely, the *Saura*, the *Chándra*, the *Nácſhatra*, the *Sávana*. "That of *Vřihaſpati (Guru)* is formed into ſixty years. The other diſtinctions "occur but ſeldom in aſtronomical practice."

Brahma's *year* is that, whereof the *Calpa* is one day. The *Daiva* year conſiſts of 360 revolutions of the ſun through the ecliptick. The *Pitrya* day is from lunation to lunation. The *Prajápati-mána* is the *manwantara*. The cycle of *Guru* or *Vřihaſpati*, which is the ſubject of this paper, will be explained further on. The *Chándra* is lunar, and the *Nácſhatra* ſidereal time. The *Saura* and *Sávan*, are the ſame ſolar-ſidereal year differently divided; the ſun's paſſage through each degree of the ecliptick being accounted as a day of the firſt, and the time contained between ſun-riſe and ſun-riſe as a day of the laſt; conſequently, there are 360 days, or diviſions, in the former year; whereas, the latter year is determined, according to the aſtronomical rules of the beſt authority, as containing $\overset{D}{365}\ \overset{D}{15}\ \overset{P}{31}\ \overset{V.P}{31}\ \overset{A.P}{24}$ of *Hindu*, or $\overset{D}{365}\ \overset{H}{6}\ \overset{M}{12}\ 36''\ 33'''\ 36''''$ of our, time.

The *Sávan* year may, as the *Hindus* obſerve, be meaſured by the following method, which is little more than a tranſlation from the *Sanſcrit*.

Upon a large horizontal circle, note the point whereon the ſun riſes, at any time near the equinox, or, when his motion in declination is the moſt perceptible; and count the number of *Sávan* days, or of his ſucceſſive riſings, from that time; until having viſited the two ſolſtices, he ſhall be returned near to the original mark; then, repeat the operation, until he riſes next after paſſing over that original or firſt-made mark, and compute the proportion which the ſpace, whereby he ſhall have fallen ſhort of it, in the laſt obſervation but one, bears to the whole ſpace contained between the marks made of his two laſt riſings, accounting that ſpace to contain 60 *Dandas*, or one *Sávan* day: the reſult will be the fraction (allowing for

preceſſion)

preceſſion) of a day, and it will be the exceſs of the year over 355 days, or number of times that the ſun will have been found to riſe above the horizon during ſuch an obſervation of his progreſs through the ecliptick. This fraction the *Súrya Siddhánta* ſtates as D D P V.P A.P 0 15 31 31 24, and the *Siddhánta Sirómani* as D D P V.P A.P 0 15 30 22 30; but it is not probable, that either quantity was determined by ſo ſimple and mechanical a method alone, or without recourſe to a ſeries of obſervations made at diſtant periods.

The *Vrĭhaſpati mána*, of which the cycle of ſixty years is compoſed, is thus deſcribed in the comment on the foregoing *ſlócas*:

बृहस्पतेर्मानं मध्यमराशिभोगेनोक्तं ॥

Vrihaſpetérmánan madhyamaráſibhógénóctan.

"It is his (*Vrihaſpati*'s) mean motion (*madhyama*) through one ſign *."

To explain what is meant by the *madhyama*, in contradiſtinction to the *ſighra*, motion of *Jupiter*, and the other planets, and to ſhew that, by compounding them in eccentrick circles and epicycles, the *Hindus* compute the apparent places of the planets on the principles of the *Ptolemaick* aſtronomy, is not the object of this paper: I ſhall, therefore, only deſire it may be underſtood, that the *madhyama* of *Jupiter* anſwers to his mean motion in his orbit, and the amount of it computed for any particular interval, to his mean heliocentrick longitude in the *Hindu* ecliptick. The rule then for computing his *mána*, or year, of which the cycle of ſixty years is formed, is evident; and it is thus given in the 55th *ſlóca* of the firſt ſection of the *Súrya Siddhánta*.

द्वादशघ्नो गुरोर्यातो भगणा वर्तमानकैः ।
राशिभिः सहितः शुद्धः षष्ट्या स्यार्विजयादयः ॥

Dwádaſághná guró yáta bhagáná vertamánacaih
Ráſibhih ſahitáh ſúddáh ſhaſhtyá ſyurvijáyádayah

* Correct an error in p. 269, in the note on the *Hindu* cycle of ſixty, for *degree* read *ſign*.

"Multiply

" Multiply by 12 *Jupiter*'s expired *bhaganas* (revolutions), and (to the product) " add the ſign he is in; divide (the ſum) by 60; the remainder, or fraction, ſhows " his current year, counting from *Vijaya* as the firſt of the ſeries."

To apply this rule in finding the *Vrihaſpati* year, for a given time, as for the commencement of the current year of the *cali yug*, or when 4892 years of that era were expired, correſpondent with the 10th of laſt *April*, we have the following data*. The revolutions or mean motion of *Jupiter*, 364220 in 4320000 ſolar years; and the term expired of the *cali yug* 4892 years, which, for the reaſon given in page 277, may in this caſe be uſed to ſave trouble, inſtead of the period expired of the *Calpa*: then, as 4320000 to 364220, ſo 4892 to 412 5 10° 21′ 12″ which ſhows *Jupiter*'s *madhyama* or mean heliocentrick longitude to be 5 10° 21′ 12″ after 412 complete revolutions through his orbit. But as in the inſtance of the moon's node (ſee page 297), a correction of *bija* is here to be applied to *Jupiter*'s mean place at the rate of 8 revolutions in the *mahá yug* ſubſtractive. But 8 revolutions in 4320000 years are as 1° to 1500 years; therefore by a ſhorter proceſs, the term expired of the *cali yug*, divided by 1500, quotes the *bija* in degrees; and $\frac{4892}{1500}=3°\ 15'\ 41''\ 48'''$ is the correction ſubſtractive, which reduces *Jupiter*'s mean place to (412) 5 7° 5′ 30″: then 412×12=4944, to which add 6, *Jupiter* being in the ſixth ſign; the ſum 4950 is the number of the *Vrihaſpati* years elapſed ſince the beginning of the *cali yug*; which, divided by 60 for cycles, quotes 82 cycles expired, leaving a fraction of $\frac{30}{60}$ to find his current year, which, counted as the rule directs from *Vijaya* as the firſt, falls on *Dundubhi*, which is the 56th of the cycle; and, of this year, the fraction 7° 5′ 30″ reduced at the rate of 2° 30′ to a month, ſhows 2 25 6 12 to have been expired on the 1ſt of *Vaiſácb*, or the 10th of *April*, for which time the computation is made; and likewiſe, that the next year *Rudhiródgári* will commence in the enſuing ſolar month of *Mágha*.

A *Nádiya* almanack for the preſent year ſtates, that on the 1ſt of laſt *Vaiſach*, there were expired of the *Vrihaſpati* cycle 55 years, 2 months, 23 days, and 10 *dandas*; and that the current year *Dundubhi* will continue until the 7th day of the ſolar month of *Mágh*: the difference of one day and 56 *dandas*, between this and the foregoing reſult, is too great to be accounted for by the difference of longitude be-

* From page 269.

tween

tween *Nadíya* and *Ujjein*, for the meridian of which latter place computations by the *Súrya Siddhánta* are made; but it is of no conſequence to the intended purpoſe of this paper.

There is another rule for computing the *Vrĭhaſpati* year given in an aſtrological book named *Jyautiſtatva*. "The *ſáca* years note down in two places. Multiply "(one of the numbers) by 22. Add (to the product) 4291. Divide (the ſum) "by 1875. The quotient add to the ſecond number noted down, and divide (the "ſum) by 60. The remainder or fraction will ſhow the year laſt expired, count- "ing from *Prabhǽva* as the firſt of the cycle. The fraction, if any, left by the "diviſor 1875 may be reduced to months, days, &c. expired of the current year."

The *ſáca* years expired on the 1ſt of laſt *Vaiſácĥ*, correſponding with the expired years 4892 of the *cali yug*, were 1713: then, by the rule,

$$\frac{1713\times 22+4291}{1875}=22\tfrac{727}{1875},\text{ and, }\frac{1713+22}{60}=28\tfrac{55}{60}$$

which ſhows the laſt expired year of *Vrĭhaſpati* to have been the 55th year of the cycle named *Durmati*; and the fraction $\frac{727}{1875}$, when reduced, that 4 months, 19 days, and 35 *dandas* were expired of the current year *Dundubhi* when laſt *Vaiſácha* began.

The numbers 22 and 1875 uſed in this computation are evidently derived from the planetary periods, as given by ARYABHATTA; which according to VARA'HANIHIRA are, of *Jupiter*, 364224 mean revolutions in 4320000 ſolar years: but 364224 revolutions of *Jupiter* contain 4370688 of his years, which exceed the correſpondent ſolar years 4320000 by 50688; and thoſe two numbers reduced to their loweſt terms are 1875 and 22; or, in 1875 ſolar years, there is an exceſs of 22 *Vrĭhaſpati* years; and hence the uſe of thoſe numbers is obvious. The additive number 4892, by the *Hindu* aſtronomers termed *cſhépa*, adjuſts the computation to the commencement of the era *ſáca*, which began when the 3179th year expired of the *cali yug*; and it ſhows that 2 years, 3 months, and 13 days were then expired of the current cycle of *Jupiter*, or 3 months and 13 days of the year *Sucla*, which is the third of that cycle. A computation by the *Súrya Siddhánta* for the ſame period, with a correction of *bíja*, as in the foregoing example, makes 2 months, 9 days, 56 *dandas*, and 12 *palas* to have been elapſed of that year, and that conſequently there were 57 years, 9 months, 20 days, 3 *dandas*, and 12 *palas* then wanting to complete the cycle, inſtead of 49 years as it is ſtated in the Philoſophical Tranſactions;

tions; and, by the ſame rule, the year of CHRIST 1784 correſponded with the 48th and 49th cycle, or *Ananda* and *Rácſhaſa*.

This mode of computation diſagrees with the date of a grant of land mentioned in Vol. I. p. 535, *Sir William Jones*'s *Works*; for *ſáca* 939 muſt have ended in the 3d month of the 53d year of the *Vřihaſpati* cycle; but, as the grant in queſtion appears to have been made in the vicinity of *Bombay*, the difference may be accounted for in a manner, that will equally explain the diſagreement noticed by Mr. MARSDEN between his authorities and the *Banáres* almanack. We learn from VARA'HAMIHIRA'S commentator, there were ſome who erroneouſly ſuppoſed the ſolar and *Vrihaſpati* years to be of the ſame length. A memorial *ſlóca* known to moſt *Pandits*, furniſhing a conciſe rule to find the *Vřihaſpati* year, mentions aſtronomers in countries ſouth of the *Nermadá* to be in their reckoning of it ten years behind thoſe ſituated on the north ſide of that river; by the foregoing compariſon of the date in the Aſiatick Reſearches with a computation by the *Súrya Siddhánta*, the difference is found to be 2 years; and the *Banáres* almanack for the preſent year mentions, that ſouth of the *Nermadá*, the 45th year of the cycle, named *Viródhacrit*, was accounted to begin in laſt *Mágh*; in which month, it is further obſerved, began at *Banáres* the preſent year *Dundubhi*, which is the 56th of the cycle. This difference then increaſes, and from the *ſáca* year 939, when it was 2 years, it had to laſt *Mágh* become 11 years. Now, in the interval of 773 ſolar years between thoſe points of time, the *Vrihaſpati* reckoning muſt have gained upon the ſolar reckoning about 9 years, which, added to the former difference of 2 years, is equal to the difference now actually noticed in the *Banáres* almanack; and we may thence conclude, that the erroneous notion mentioned and refuted by VARA'HAMIHIRA'S commentator, ſtill prevails to the ſouth of the *Nermadá*, from which part of *India* Mr. MARSDEN's information on the ſubject ſeems to have been originally procured. But there is no reaſon to ſuppoſe, that the *Vřihaſpati* year is any where conſidered as "commencing on the ſame day with the years of VICRAMA'DITYA and SA'LIVA'HAN;" nor is it poſſible that it ſhould; becauſe the latter, which is ſolar-ſidereal, commences with the ſun's entrance of *Aries* in the *Hindu* ecliptick; and the former, which is luni-ſolar, with the preceding new moon in the month of *Chaitra*.

It may not be deemed ſuperfluous here to add VARA'HAMIHIRA'S explanation of *Jupiter*'s two cycles of 12 and 60; more eſpecially as he cites certain particulars with a reference

a reference to the poſition of the colures as deſcribed by PARA'SARA, and explained in the preceding volume of this work.

Text.—" *Of Vrĭhaſpati*'s 12 *years.* The name of the year is determined from " the *Nacſhatra*, in which *Vrĭhaſpati* riſes and ſets (heliacally) and they follow in " the order of the lunar months."

Commentary.—" But if, as it may happen, he ſhould ſet in one and riſe in " another *Nacſhatra*, which of the two, it may be aſked, would give name to his " year? Suppoſe him, for example, to ſet in *Róhini* and to riſe in *Mrigaſiras*:—I " anſwer, that in ſuch a caſe, the name muſt be made to agree with the order of " the months; or, it muſt be that name, which in the regular ſeries follows the " name of the year expired. According to SASIPUTRA and others, the *Nacſhatra* " in which *Jupiter* riſes gives the name to his year. CASYAPA ſays, the names of " the *Samvatſura Yuga*, and the years of the *cycle of ſixty*, are determined from the " *Nacſhatra* in which he *riſes*; and GARGA gives the ſame account. Some ſay, " that *Cartic*, the firſt year of the cycle of 12, begins on the firſt day of the month " of *Chaitr*, whatever may be the *Nacſhatra* which *Jupiter* is then in; and that " *Prabhava* likewiſe, the firſt year of the cycle of ſixty, begins in the ſame man- " ner; and ſome ſay that *Jupiter*'s years are coincident with the ſolar years; but " that cannot be true, becauſe the ſolar year exceeds in duration the *Vrĭhaſpati* " year," &c.

Text.—" The years beginning with *Cartic* commence with the *Nacſhatra Criticà*, " and to each year there appertain two *Nacſhatras*, except the 5th, 11th, and 12th " years, to each of which appertain three *Nacſhatras*."

Commentary.—" The years and their correſponding *Nacſhatras* are,"

YEARS.	NACSHATRAS.
Cártic.	Criticà, Róhinì.
A'grahayan.	Mrigaſiras, A'rdrà.
Pauſh.	Punarvaſu, Puſhya.
Mágh.	Aſléſhá, Maghà.
Phálgun.	Purvap'halgunì, Uttarap'halgunì Haſta.
Chaitr.	Chitrà, Swáti.
Vaiſách.	Viſácha, Anurádhà.
Jyaiſhth.	Jyéſht'hà, Múla.
Aſhar.	Purvaſhárá, Uttaráſhára.
Srávan.	Sravanà, Dhaniſh't'hà.

Bhádr

Bhádr.	Satabhiſhà, Purvabhadrapadà, Uttarabhadrapada.
Aſwin.	Révati, Aſwinì, Bharanì.

" Some, on GARGA's authority, hold it to be the 10th inſtead of the 12th year " to which three *Nacſhatras* appertain. GARGA's arrangement of them is thus."

Phálgun.	Purvap'halgunì, Uttarap'halgunì, Haſta.
Srávan.	Sravanà, Dhaniſh't'hà, Satabhiſhà.
Bhádr.	Purvabhadrapadà, Uttarabhadrapadà, Revati.
Aſwin.	Aſwinì, Bharanì.

" PARASERA's rule ſtates, that when *Vrihaſpati* is in

" *Criticà* and *Rohinì*, the year is	bad.
" *Mrigaſiras*, *Ardrà*	bad.
" *Punarvaſu*, *Puſhya*	good.
" *Aſléſha*, *Maghà*	bad.
" *Purvap'halgunì*, *Uttarap'halgunì*, *Haſta*	neutral.
" *Chitrà*, *Swáti*	good.
" *Viſáchà*, *Anurádhà*	bad.
" *Jyéſht'ha*, *Múla*	bad.
" *Purvaſhára*, *Uttaraſhára*	good.
" *Sravanà*, *Dhaniſthà*, *Satabhiſhà*	good.
" *Purvabhadrapadà*, *Uttarabhadrapadà*, *Revati*	good.
" *Aſwinì*, *Bharanì*	good.

" On thoſe authorities, therefore, it is the 10th and not the 12th year to which " three *Nacſhatras* appertain "

Text.—" *Of the* Vrihaſpati *cycle of ſixty years.* Multiply the expired years of " *Saca* by 11, and the product by 4. Add the *chépa* 8589. Divide the ſum by " 3750*; and the quotient add to the years of *Saca.* Divide the ſum by 60 to find " the year, and by 12 to find the *yuga.* The *Dévas* who preſide over the twelve " years of the *yuga* are,

" Viſhnu,	*The Pitris*,
" Súrya,	Vis'wa.
" Indra,	Sóma.
" Agni,	Indrágni.

* Theſe numbers, 11×4 and 3750 are in the ſame ratio as thoſe uſed in the foregoing example from the *Jyautiſhatwa*: the two rules therefore are the ſame, with an inconſiderable difference in the *cſhépa*.

" Twaſhtà,

" Twaſhtà, A'ſwina.
" Ahivradna, Bhaga."

Commentary.—" It is in the *Sómaſanhitá* that the preſiding *Dévas* are thus ſtated. In the cycle of ſixty are contained five cycles of twelve; which five cycles, or " *yugas*, are named

" *Samvatſara*, over which preſides - - - - - *Agni.*
" *Parivatſara* - - - - - - - *Arca.*
" *Idavatſara* - - - - - - - *Chandra.*
" *Anuvatſara* - - - - - - - *Brahmà.*
" *Udravatſara* - - - - - - - *Siva.*

Text.—" The firſt year of the cycle of ſixty, named *Prabhava*, begins, when in the month of *Mágha*, *Vrĭhaſpati* riſes in the firſt degree of the *Nacſhatra Dhan-* " *iſht'hà*; and the quality of that year is always good."

Commentary.—" The month of *Mágh* here meant is the lunar *Mágh*: it cannot " be the ſolar *Mágh*, becauſe when *Vrĭhaſpati* riſes in 9ˢ 23° 20′ *Súrya* muſt be in " 10ˢ 6° 12′*."

The years of the cycle and the preſiding *Deities* are thus arranged by VARA'HAMIHIRA in ſix memorial couplets.

BRA'HMA.	VAISHNAVA.	SAIVA.
Prabhava,	Bahudhanya,	Viródhi,
Vibhava,	Pramát'hi,	Vicrita,
Sucla,	Vicrama,	25. C'hara,
Pramóda,	15. Briſya,	Nandana,
5. Prajápati,	Chitrabhánu,	Vijaya,
Angira,	Subhánu,	Jaya,
Srímuc'ha,	Tárana,	Manmat'ha,
Bhává,	Párthiva,	30. Durmuc'ha,
Yuvà,	20. Vyaya,	Hémalamva,
10. Dhátâ,	Sarvajit,	Vilamva,
Iſwara,	Sarvadhári,	Vicári,

* Becauſe the beginning of *Dhaniſht'hà* is weſt of the end of *Mágh* only 6° 40′, at which diſtance from the ſun, *Jupiter* would not riſe heliacally, or be ſeen diſengaged from his rays; but the lunar *Mágh* might extend to near the end of the ſolar *Phálgun*. Should the moon, however, change very ſoon after the ſun's entrance of the *Hindu* ſign *Capricorn*, coincident with *Mágh*, then, neither the ſolar nor the lunar month of that name would agree with the terms of the propoſition; which is an inſtance of an imperfect aſtronomy.

Sarvari,	Saumya,	Cálayucta,
35. Plava,	Sádhárana,	Sidhárthi,
Subhacrit,	45. Viródhacrit,	Raudra,
Sóbhana,	Paridhávi,	55. Durmati,
Crádhi,	Pramádi,	Dundubhi,
Viſwávaſu,	A'nanda,	Rudhiródgári,
40. Parábhava,	Rácſhaſa,	Ractácſha,
Plavanga,	50. Anala,	Cródhana,
Cílaca,	Pingala,	60. Cſhaya.

It may be remarked, that, in the foregoing arrangements of the *Vrĭhaſpati* years, *Cártic* is always placed the firſt in the cycle of twelve; and, ſince it is a main principle of the *Hindu* aſtronomy to commence the planetary motions, which are the meaſures of time, from the ſame point of the ecliptick, it may thence be inferred, that there was a time when the *Hindu* ſolar year, as well as the *Vrĭhaſpati* cycle of twelve, began with the ſun's arrival in, or near, the *Nacſhatra Criticà*. That this year has had different beginnings is evinced by the practice of the *Chineſe* and *Siameſe*, who had their aſtronomy from *India*, and who ſtill begin their years, probably by the rule they originally received, either from the ſun's departure from the winter ſolſtice, or from the preceding new moon, which has the ſame reference to the winter ſolſtice that the *Hindu* year of VICRAMA'DITYA has to the vernal equinox. The commentator on the *Súrya Siddhánta* expreſsly ſays, that the authors of the books generally termed *Sanhitás*, accounted the *Déva* day to begin in the beginning of the ſun's northern road: now, the *Déva* day is the ſolar year; and the ſun's northern road begins in the winter ſolſtice; and hence it ſhould ſeem, that ſome of thoſe authors began the ſolar year exactly as the *Chineſe* do at this time. This might moreover have been the cuſtom in PARA'SARA's time; for the phenomenon, which is ſaid to mark the beginning of the *Vrĭhaſpati* cycle of ſixty, refers to the beginning of *Daniſht'ha*, which is preciſely that point of the ecliptick through which the ſolſtice paſſed when he wrote.

There are, beſide theſe apparent changes made by the *Hindus* in their mode of commencing the year, abundant inſtances of alterations and corrections in their aſtronomy, an inquiry into which might, by fixing certain chronological data, throw conſiderable light on their hiſtory; and it is ſcarcely neceſſary to obſerve, with how much more advantage an inveſtigation of this kind would be made with the

aſſiſtance

assistance of such astronomical books, written in the *Déva Nagari* characters, as might easily be had from *Haidarábad* and *Púna*, if the *English* residents there would interest themselves to procure them. Copies of the astronomical rules, followed at *Bombay* and *Gujarat*, might also prove of use, if NIEBUHR * was not misinformed, who says the natives there begin the year with the month of *Cártic*, which has an evident reference to the autumnal equinox, and may perhaps be computed by the *Arsha Siddhánta*, mentioned in Vol. I. as accounting the day to begin at sunset; for sunset with the *Dévas* is the sun's departure from the autumnal equinox, and it is invariably observed in their astronomy to account the different measures of time as having begun originally from the same instant.

But of all places in *India*, to which *Europeans* might have access, *Ujjein* is probably the best furnished with mathematical and astronomical productions; for it was formerly a principal seminary of those sciences, and is still referred to as the first meridian. Almost any trouble and expence would be compensated by the possession of the three copious treatises on Algebra, from which BHA'SCARA declares he extracted his *Bija Genita*, and which in this part of *India* are supposed to be entirely lost. But the principal object of the proposed inquiry would be, to trace as much as possible of that gradual progress, whereby the *Hindu* astronomy has arrived at its present state of comparative perfection; whence might be formed more probable conjectures of its origin and antiquity than have yet appeared: for I imagine, there are few of M. BAILLY's opinion that the *cali yug*, or any *yug*, had its origin, any more than our *Julian* period, in *an actual observation*, who have considered the nature and use of those cycles, of the relative *bhaganas*, or revolutions of the planets, and the alterations † which the latter have at different times undergone; concerning which several particulars M. BAILLY, it must be acknowledged, had but little information ‡. What was the real position of the planets and the state of astronomy when the *cali yug* began, or 4892 years ago, will probably never

* "Le nouvel an chez les *Indiens* à *Guzerat*, que ceux de *Bombay* suivent aussi, vient du mois *Kartig*, mais à *Scindi* on le célébré au mois *Asar*." Tom. ii. p. 21.

† Instances in *Jupiter*'s mean motion. A'RYABHATTA gave the revolutions as 364224 in 4320000 solar years. BHA'SCAR in his *Sirómani* 364226455 in 4320000000 solar years. The *Súrya Siddhánta* 364220 in 4320000 solar years; which latter, by the *bija* introduced since, are reduced to 364212 in the same period.

‡ But it is not thence to be inferred, that the *Hindus* did *not* exist as a nation, or that they made *no* observations of the heavens as long ago as 4890 years: all that is here meant is, that the observation ascribed to them by M. BAILLY does not necessarily follow from any thing that is known of their astronomy; but, on the contrary, from the nature of the subject it appears, that the *Cali yug* was, like the *Julian* period, fixed by retrospective computation; which might still have happened although astronomy had originated, which is not at all improbable, in much higher antiquity.

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never be known; but the latter muſt certainly have undergone conſiderable improvement ſince the laſt quoted *ſlóca* of VARA'HAMIHIRA was received as a rule; for it ſuppoſes the mean motion of *Jupiter* to be to that of the ſun, as 60 to ſome integer; apparently to 720; as 5 to 60, or as 1 to 12; without which, the beginning and ſucceſſive returns of the cycle of ſixty could never be denoted by the heliacal riſing of *Jupiter* in *Dhaniſht'hà*, or in any conſtant point of the zodiack; and at a time when the mean motion of *Jupiter* was ſo much miſtaken, it may reaſonably be ſuppoſed, that the more difficult parts of aſtronomy were very imperfectly underſtood. If the ratio were as 1 to 12, which is implied by the *yuga* of twelve (for the term *yuga* means conjunction, or coincidence), then a conjunction of the ſun and *Jupiter* would happen at the end of every period of twelve years in the ſame point of the zodiack, and the cycle of ſixty might begin in the manner deſcribed: but this muſt long ſince have ceaſed to be the rule, or at leaſt ſince the time of A'RYABHATTA; for, if the cycle be ſuppoſed to begin with the ſun and *Jupiter* in *Dhaniſht'hà*, then in ſixty of *Jupiter*'s years that planet will again be in *Dhaniſht'hà*; but, in ſixty of ſuch years there are, by the data aſcribed to A'RYABHATTA, only 59 years, 3 months, and ſome days of ſolar time; the next cycle, therefore, could not have the ſame beginning, becauſe the ſun would be found more than 90 degrees diſtant from *Jupiter*'s mean place, and in 60 years more that diſtance would be doubled. As this diſagreement with the rule could not have been unknown to VARA'HAMIHIRA, who gives the *bhaganas* from A'RYABHATTA as 364224 in 4320000 ſolar years, he may be ſuppoſed to have only cited what he had learned from other treatiſes merely as an aſtrological maxim, his *Sanhità* being a treatiſe on *aſtrology* not on practical *aſtronomy*; and this conjecture will appear the more reaſonable, when it is conſidered, that notions wholly incon-

* Neither LE GENTIL, nor BAILLY, had any other authority for placing the origin of the *Hindu* zodiack in longitude 10s 6°, at the beginning of the *cali yug*, than reſults from a computation of the preceſſion for 3600 years, at the end of which expired term of the *cali yug*, it coincided with the equinox: it is certain, that the *Bráhmens* in this part of *India* ſuppoſe, as their aſtronomy implies, a ſimilar coincidence, together with a conjunction of the planets in the ſame point by their mean motions when the *cali yug* began; and ſince in the preſent amount of the preceſſion, and conſequently in the origin of the zodiack, as well as in many other particulars, the *Bráhmens* of *Trivalore* agree with thoſe of *Bengal*, it is not at all probable, that they ſhould have different ſyſtems. But M. BAILLY thinks the *Indian* zodiack has had two origins; one of them as I deſcribe it, the other, as he computes it from the beginning of the *cali yug*:—it may indeed have had many origins, although there ſeems at preſent but one to be found; for it is not in the leaſt inconſiſtent with the principles of the *Hindu* aſtronomy to ſuppoſe that, if ever an alteration took place in the mode of beginning the year, ſome alteration was at the ſame time made in the origin of the zodiack likewiſe. The origin of the *Chineſe* zodiack is deſcribed to be in a part of the heavens oppoſite to that of the *Hindus*; for *Spica* diſtinguiſhes their conſtellation *Kiv*, which is the firſt of their twenty-eight lunar manſions; and ſince it is agreed, that both ſyſtems were originally the ſame, a conſiderable alteration, with reſpect to the origin of the zodiack, muſt neceſſarily have happened in one of them.

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ſiſtent with the latter, and which muſt have originated in remote ages, when ſcience of any kind had made but ſmall progreſs, are ſtill preſerved in different *ſáſtras*; as in the *Bhágavat*, which, treating on the ſyſtem of the univerſe, places the moon above the ſun, and the planets above the fixed ſtars.

To render this paper more intelligible, I have ſubjoined a diagram of the *Hindu* ecliptick, which may alſo ſerve to illuſtrate ſome aſtronomical papers in the preceding volume. Its origin is conſidered as diſtant 180 degrees in longitude from *Spica:* a ſtar, which ſeems to have been of great uſe in regulating their aſtronomy, and to which the *Hindu* tables of the beſt authority, although they differ in other particulars, agree in aſſigning fix ſigns of longitude counted from the beginning of *Aſwiní*, their firſt *Nacſhatra*. From the beginning of *Aſwiní* (according to the *Hindu* preceſſion, now 19° 22′, but which is in reality ſomething further diſtant from the vernal equinox) the ecliptick is divided into twenty-ſeven equal parts, or *Nacſhatras*, of 13° 20′ each; the twenty-eighth, named *Abhijit*, being formed out of the laſt quarter of *Uttaràſhára*, and as much of *Sravanà* as is neceſſary to complete the moon's periodical month. The years of *Jupiter*'s cycle are expreſſed in their order with numerals: *a* is the former poſition of the colures, as explained in Vol. II. and *b*, *c*, mark the limits of the preceſſion reſulting from the *Hindu* method of computing it. The outer dotted circle is the *European* ecliptick, in which is noted the beginning of the *Hindu*, and likewiſe of the *European* year. For want of room the ſigns are diſtinguiſhed in both with the uſual characters. The two ſtars pointed out by the moſt ſkilful *Pandit* I have yet met with, as diſtinguiſhing *Aſwiní*, are β and γ *Arietis*, which diſtinguiſh alſo *al ſharatán*, the firſt *Arabian menzil*; and the latter is ſaid to be the *yóga*, whoſe longitude and latitude are ſtated certainly with great incorrectneſs, as 8° and 10° north; but the error, if it be not owing to tranſcribers, is inexplicable.

The ſolar months, it may be obſerved, correſpond in name with the like number of *Nácſhatras:* this is aſcribed to the months having been originally lunar, and their names derived from the *Naeſhatras*, in which the moon, departing from a particular point, was obſerved to be at the full; for, although the full moon did not always happen in thoſe particular *Nacſhatras*, yet the deviation never exceeded the preceding or the ſucceeding *Nacſhatra*; and whether it fell in *Haſta*, *Chitra*, or *Swáti*, ſtill that month was named *Chaitrà*; and ſo of the reſt. This is the explanation of the month given by NRISINHA, who in the ſame manner explains *Jupiter*'s cycle of twelve

twelve years, the names of which could not always correſpond with thoſe of the *Nacſhatras*, in which he roſe heliacally.

Of the *Hindu* method of intercalating the lunar month, M. BAILLY conceived a right idea from what P. DU CHAMP had ſaid on the ſubject; but he has omitted to mention a curious circumſtance conſequent to it, which is, that ſometimes there happen *two* intercalary months in the ſame year; or, to be more preciſe, *two* lunar months are named *twice* over: thus, as was actually the caſe in 1603 *Sáca*, there may be two lunar *Aſwinas* and two *Chaitras*; but then ſome one intervening month, as *Agraháyan*, would be omitted, becauſe the change of the moon would not happen at all during the ſolar month of that name. During the preſent poſition of the ſun's apſis, this *ch'che* (cſhaya?) or diſcarded month, is limited to *Agraháyan*, *Pauſh* or *Mágh*, thoſe being the three ſhorteſt ſolar months; and, by the *Hindu* computation, the diſcarded month will again fall on *Agraháyan* in 1744 *Sáca*.

Bhágalpur, 1 *Dec.* 1791.

X.

AN ACCOUNT OF THE METHOD OF CATCHING WILD ELEPHANTS AT TIPURA.

By JOHN CORSE, *Eſq.*

IN the month of *November*, when the weather has become cool, and the ſwamps and marſhes, formed by the rains in the five preceding months, are leſſened, and ſome of them dried up, a number of people are employed to go in queſt of elephants.

At this ſeaſon the males come from the receſſes of the foreſt into the borders and outſkirts thereof, whence they make nocturnal excurſions into the plains in ſearch of food, and where they often deſtroy the labours of the huſbandman, by devouring and trampling down the rice, ſugar canes, &c. that they meet with. A herd or drove of elephants, from what I can learn, has never been ſeen to leave the woods:

woods: ſome of the largeſt males often ſtray to a conſiderable diſtance, but the young ones always remain in the foreſt under the protection of the *Palmai* or leader of the herd, and of the larger elephants. The *Goondahs*, or large males, come out ſingly, or in ſmall parties, ſometimes in the morning, but commonly in the evening, and they continue to feed all night upon the long graſs, that grows amidſt the ſwamps and marſhes, and of which they are extremely fond. As often, however, as they have an opportunity, they commit depredations on the rice fields, ſugar canes, and plantain trees, that are near, which oblige the farmers to keep regular watch, under a ſmall cover, erected on the tops of a few long bamboos, about 14 feet from the ground: and this precaution is neceſſary to protect them from the tigers, with which this province abounds. From this lofty ſtation the alarm is ſoon communicated from one watchman to another and the neighbouring villages, by means of a rattle with which each is provided. With their ſhouts and cries, and noiſe of the rattles, the elephants are generally ſcared and retire. It ſometimes however happens that the males advance even to the villages, overturn the houſes, and kill thoſe who unfortunately come in their way, unleſs they have had time to light a number of fires: this element ſeems to be the moſt dreaded by wild elephants, and a few lighted wiſps of ſtraw or graſs ſeldom fail to ſtop their progreſs. To ſecure one of the males a very different method is employed from that which is taken to ſecure a herd: the former is taken by *Koomkees*, or female elephants trained for the purpoſe, whereas the latter is driven into a ſtrong encloſure called a *Keddah*.

As the hunters know the places where the elephants come out to feed, they advance towards them in the evening with four *Koomkees*, which is the number of which each hunting party conſiſts: when the nights are dark, and theſe are the moſt favourable for their purpoſe, the male elephants are diſcovered by the noiſe they make in cleaning their food, by whiſking and ſtriking it againſt their fore-legs, and by moon-light they can ſee them diſtinctly at ſome diſtance.

As ſoon as they have determined on the *Goondah* they mean to ſecure, three of the *Koomkees* are conducted ſilently and ſlowly by their *Mahotes* (drivers) at a moderate diſtance from each other, near to the place where he is feeding; the *Koomkees* advance very cautiouſly, feeding as they go along, and appear like wild elephants that had ſtrayed from the jungle. When the male perceives them approaching, if he takes the alarm and is viciouſly inclined, he beats the ground with his trunk and makes a noiſe, ſhewing evident marks of his diſpleaſure, and that he will not allow them

them to approach nearer; and if they perſiſt, he will immediately attack and gore them with his tuſks: for which reaſon they take care to retreat in good time. But ſhould he be amorouſly diſpoſed, which is generally the caſe (as theſe males are ſuppoſed to be driven from the herd at a particular period by their ſeniors, to prevent their having connection with the females of that herd), he allows the females to approach, and ſometimes even advances to meet them.

When from theſe appearances, the *Mahotes* judge that he will become their prize, they conduct two of the females, one on each ſide cloſe to him, and make them advance backwards, and preſs gently with their poſteriors againſt his neck and ſhoulders: the third female then comes up and places herſelf directly acroſs his tail: in this ſituation, ſo far from ſuſpecting any deſign againſt his liberty, he begins to toy with the females and careſs them with his trunk. While thus engaged, the fourth female is brought near, with ropes and proper aſſiſtants, who immediately get under the belly of the third female, and put a ſlight cord (the *Chilkah)* round his hind legs; ſhould he move, it is eaſily broken, in which caſe, if he takes no notice of this ſlight confinement, nor appears ſuſpicious of what was going forward, the hunters then proceed to tie his legs with a ſtrong cord (called *Bunda)* which is paſſed alternately, by means of a forked ſtick and a kind of hook, from one leg to the other, forming the figure of 8, and as theſe ropes are ſhort, for the convenience of being more readily put around his legs, 6 or 8 are generally employed, and they are made faſt by another cord (the *Dagbearee)* which is paſſed a few turns perpendicularly between his legs, where the folds of the *Bundahs* interſect each other. A ſtrong cable (the *Phand)* with a running nooſe, 60 cubits long, is next put round each hind leg immediately above the *Bundahs*, and again, above them, 6 or 8 additional *Bundahs*, according to the ſize of the elephant, are made faſt, in the ſame manner as the others were: the putting on theſe ropes generally takes up about 20 minutes, during which the utmoſt ſilence is obſerved, and the *Mahotes*, who keep flat upon the necks of the females, are covered with dark-coloured cloths, which ſerve to keep them warm, and at the ſame time do not attract the notice of the elephant. While the people are buſily employed in tying the legs of the *Goondah*, he careſſes ſometimes one, and ſometimes another of the ſeducers *(Kootnee)*, examining their beauties and toying with different parts, by which his deſires are excited and his attention diverted from the hunters, and in theſe amorous dalliances he is indulged by the females. But if his paſſions ſhould be ſo rouſed, before his legs are properly ſecured, as to induce him to attempt leaping on one of the females,

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the *Mahote*, to enſure his own ſafety and prevent him gratifying his deſires any farther, makes the female run away, and at the ſame time, by raiſing his voice and making a noiſe, he deters the *Goondah* from purſuing. This however happens very ſeldom; for he is ſo ſecured by the preſſure of a *Koomkee* on each ſide and one behind, that he can hardly turn himſelf, or ſee any of the people, who always keep ſnug under the belly of the third female, that ſtands acroſs his tail, and which ſerves both to keep him ſteady and prevent his kicking any of the people, who are employed in ſecuring him; but in general he is ſo much taken up with his decoyers, as to attend very little to any thing elſe. In caſe of accidents, however, ſhould the *Goondah* break looſe, the people upon the firſt alarm can always mount on the backs of the tame elephants, by a rope that hangs ready for the purpoſe, and thus get out of his reach. When his hind legs are properly ſecured, they leave him to himſelf, and retire to a ſmall diſtance: as ſoon as the *Koomkees* leave him, he attempts to follow, but finding his legs tied, he is rouſed to a proper ſenſe of his ſituation, and retreats toward the jungle; the *Mahotes* follow at a moderate diſtance from him on the tame elephants, accompanied by a number of people that had been previouſly ſent for, and who, as ſoon as the *Goondah* paſſes near a ſtout tree, make a few turns of the *Phands*, or long cables that are trailing behind him, around its trunk; his progreſs being thus ſtopped, he becomes furious and exerts his utmoſt force to diſengage himſelf, nor will he then allow any of the *Koomkees* to come near him, but is outrageous for ſome time, falling down and goring the earth with his tuſks. If by theſe exertions the *Phands* are once broken, which ſometimes is effected, and he eſcapes into the thick jungle, the *Mahotes* dare not advance for fear of the other wild elephants, and are therefore obliged to leave him to his fate; and in this hampered ſituation, it is ſaid, he is even ungenerouſly attacked by the other wild elephants. As the cables are very ſtrong and ſeldom give way, when he has exhauſted himſelf by his exertions, the *Koomkees* are again brought near and take their former poſitions, viz. one on each ſide and the other behind. After getting him nearer the tree, the people carry the ends of the long cables around his legs, then back and about the trunk of the tree, making, if they can, two or three turns, ſo as to prevent even the poſſibility of his eſcape. It would be almoſt impoſſible to ſecure an elephant in any other manner, as he would tear up any ſtake, that could at the time be driven into the ground, and even the noiſe of doing it would frighten the elephant: for theſe reaſons, as far as I can learn, nothing leſs than a ſtrong tree is ever truſted to by the hunters. For ſtill farther ſecurity, as well as to confine him

from moving to either ſide, his fore-legs are tied exactly in the ſame manner as the hind-legs were, and the *Phands* are made faſt one on each ſide, to trees, or ſtakes driven deep into the earth. During the proceſs of tying both the hind and fore legs, the fourth *Koomkee* gives aſſiſtance where neceſſary, and the people employed cautiouſly avoid going within reach of his trunk; and when he attempts to ſeize them, they retreat to the oppoſite ſide of the *Koomkees*, and get on them, if neceſſary, by means of the rope above mentioned, which hangs ready for them to lay hold of. Although, by theſe means, he is perfectly ſecured and cannot eſcape, yet as it would be both unſafe and inconvenient to allow him to remain in the verge of the jungle, a number of additional ropes are afterwards put on, as ſhall be mentioned, for the purpoſe of conducting him to a proper ſtation. When the *Goondah* has become more ſettled, and eat a little food, with which he is ſupplied as ſoon as he is taken, the *Koomkees* are again brought near, and a ſtrong rope *(Phara)* is then put twice round his body, cloſe to his fore-legs like a girth, and tied behind his ſhoulder; then the long end is carried back cloſe to his rump and there faſtened after a couple of turns more have been made round his body. Another cord is next faſtened to the *Phara* and from thence carried under his tail like a crupper *(Dooblah)*, and brought forward and faſtened by a turn or two, to each of the *Pharas* or girths, by which the whole is connected, and each turn of theſe cords ſerves to keep the reſt in their places. After this a ſtrong rope (the *Tooman)* is put round his buttocks and made faſt on each ſide to the girth and crupper, ſo as to confine the motion of his thighs and prevent his taking a full ſtep. Theſe ſmaller ropes being properly adjuſted, a couple of large cables (the *Dools)* with running nooſes are put around his neck, and after being drawn moderately tight, the nooſes are ſecured from running cloſer, and then tied to the ropes on each ſide forming the girth and crupper already mentioned; and thus all theſe ropes are connected and kept in their proper places, without any riſk of the nooſes of the *Dools* becoming tight, ſo as to endanger the life of the elephant in his exertions to free himſelf. The ends of theſe cables are made faſt to two *Koomkees*, one on each ſide of the *Goondah*, by a couple of turns round the belly, cloſe to the ſhoulder, like a girth, where a turn is made, and it is then carried acroſs the cheſt and faſtened to the girth on the oppoſite ſide. Every thing being now ready, and a paſſage cleared from the jungle, all the ropes are taken from his legs, and only the *Tooman* remains round his buttocks to confine the motion of his hind-legs: the *Koomkees* pull him forward by the *Dools*, and the people from behind urge him on. Inſtead of advancing in the direction

rection they wiſh, he attempts to retreat farther into the jungle, he exerts all his force, falls down, and tears the earth with his tuſks, ſcreaming and groaning, and by his violent exertions often hurts and bruiſes himſelf very much, and inſtances happen of their ſurviving theſe violent exertions only a few hours, or at moſt a few days. In general, however, they ſoon become reconciled to their fate, will eat immediately after they are taken, and, if neceſſary, may be conducted from the verge of the jungle as ſoon as a paſſage is cleared. When the elephant is brought to his proper ſtation and made faſt, he is treated with a mixture of ſeverity and gentleneſs, and in a few months (if docile) he becomes tractable and appears perfectly reconciled to his fate. It appears ſomewhat extraordinary, that though the *Goondah* uſes his utmoſt force to diſengage himſelf when taken, and would kill any perſon coming within his reach, yet he never, or at leaſt ſeldom, attempts to hurt the females that have enſnared him, but on the contrary ſeems pleaſed (as often as they are brought near, in order to adjuſt his harneſſing, or move and ſlacken thoſe ropes which gall him), ſoothed and comforted by them, as it were, for the loſs of his liberty. All the elephants, ſoon after they are taken, are led out occaſionally for exerciſe by the *Koomkees*, which attend for that purpoſe.

Having now related, partly from my own knowledge and partly from comparing the accounts given by different people employed in this buſineſs, the manner in which the male elephants, called *Goondahs*, are ſecured, I ſhall next, entirely from my own knowledge, deſcribe the methods I have ſeen employed for ſecuring a herd of wild elephants. Female elephants are never taken ſingly, but always in the herd, which conſiſts of young and old of both ſexes. This noble, docile, and uſeful animal, ſeems naturally of a ſocial diſpoſition, as a herd in general conſiſts of from about 40 to 100, and is conducted under the direction of one of the oldeſt and largeſt females, called the *Palmai*, and one of the largeſt males. When a herd is diſcovered, about 500 people are employed to ſurround it, who divide themſelves into ſmall parties, called *Chokeys*, conſiſting generally of one *Mahote* and two *Coolies*, at the diſtance of twenty or thirty yards from each other, and form an irregular circle in which the elephants are encloſed: each party lights a fire and clears a footpath to the ſtation that is next him, by which a regular communication is ſoon formed through the whole circumference from one to the other. By this path reinforcements can immediately be brought to any place where an alarm is given: and it is alſo neceſſary for the ſuperintendants, who are always going round, to ſee that the people are alert upon their poſts. The firſt circle (the *Dawkee*) being thus formed,

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the remaining part of the day and night is ſpent in keeping watch by turns or in cooking for themſelves and companions. Early next morning, one man is detached from each ſtation, to form another circle in that direction, where they wiſh the elephants to advance. When it is finiſhed, the people, ſtationed neareſt to the new circle, put out their fires and file off to the right and left, to form the advanced party, thus leaving an opening for the herd to advance through, and by this movement both the old and new circle are joined and form an oblong. The people from behind now begin ſhouting and making a noice with their rattles, *tomtoms*, &c. to cauſe the elephants to advance: and as ſoon as they are got within the new circle, the people cloſe up, take their proper ſtations, and paſs the remaining part of the day and night as before. In the morning the ſame proceſs is repeated, and in this manner the herd advances ſlowly in that direction, where they find themſelves leaſt incommoded by the noiſe and clamour of the hunters, feeding, as they go along, upon branches of trees, leaves of bamboos, &c. which come in their way. If they ſuſpected any ſnare, they could eaſily break through the circle: but this inoffenſive animal, going merely in queſt of food, and not ſeeing any of the people who ſurround him, and who are concealed by the thick jungle, advances without ſuſpicion, and appears only to avoid being peſtered by their noiſe and din. As fire is the thing elephants ſeem moſt afraid of in their wild ſtate, and will ſeldom venture near it, the hunters always have a number of fires lighted, and particularly at night, to prevent the elephants coming too near, as well as to cook their victuals and keep them warm. The ſentinels ſupply theſe fires with fuel, eſpecially green bamboos, which are generally at hand, and which, by the crackling and loud report they make, together with the noiſe of the watchmen, deter the elephants from coming near; ſo that the herd generally remains at a diſtance near the centre of the circle. Should they at any time advance, the alarm is given, and all the people immediately make a noiſe and uſe their rattles, to make them keep at a greater diſtance. In this manner they are gradually brought to the *Keddah*, or place where they are to be ſecured. As the natives are extremely ſlow in their operations, they ſeldom bring the herd above one circle in a day, except on an emergency, when they exert themſelves, and advance two circles. They have no tents or covering but the thick woods, which, during the day, keep off the rays of the ſun; and at night they ſleep by the fires they have lighted, upon mats ſpread on the ground, wrapt up in a piece of coarſe cloth. The ſeaſon is then ſo mild that the people continue very healthy, and an accident ſeldom happens except to ſtragglers about the outſkirts of the wood,

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who are ſometimes, though very rarely, carried off by tigers. The *Keddah*, or place where the herd is to be ſecured, is differently conſtructed in different places; here it conſiſts of three encloſures communicating with each other by means of narrow openings or gateways. The outer encloſure, or the one next to the place where the elephants are to enter, is the largeſt; the middle one is generally, though not always, the next in ſize, and the third or furthermoſt is the ſmalleſt: theſe proportions, however, are not always adhered to in the making of a *Keddah*, nor indeed does there appear to me any reaſon for making three encloſures; but as my intentions are merely to relate facts, I ſhall proceed to obſerve, that when in the third or laſt encloſure, the elephants are then only deemed ſecure: here they are kept ſix or eight days, and are regularly, though ſcantily, fed from a ſcaffold on the outſide, cloſe to the entrance of an outlet called the *Roomee*, which is about ſixty feet long, and very narrow, and through which the elephants are to be taken out one by one. In many places this mode is not adopted; for as ſoon as the herd has been ſurrounded by a ſtrong paliſade, *Koomkees* are ſent in with proper people, who tie them on the ſpot, in the ſame manner as was mentioned above of the *Goondahs*, or male elephants, they are taken ſingly. Theſe encloſures are all pretty ſtrong, but the third is the ſtrongeſt, nor are the elephants deemed ſecure, as already obſerved, till they have entered it. This encloſure has, like the other two, a pretty deep ditch on the inſide; and upon the bank of earth, that is thrown up from the excavation, a row of ſtrong paliſades of middle-ſized trees is planted, ſtrengthened with croſs bars, which are tied to them about the diſtance of fourteen inches from each other; and theſe are ſupported on the outſide by ſtrong poſts like buttreſſes, having one end ſunk in the earth and the other preſſing againſt the croſs bars to which they are faſtened. When the herd is brought near to the firſt encloſure, or *Baigcote*, which has two gateways towards the jungle, from which the elephants are to advance (theſe as well as the other gateways are diſguiſed with branches of trees and bamboos ſtuck in the ground, ſo as to give them the appearance of a natural jungle), the greateſt difficulty is to get the herd to enter the firſt or outer encloſure; for notwithſtanding the precautions taken to diſguiſe both the entries as well as the paliſade which ſurrounds this encloſure, the *Palmai*, or leader, now appears to ſuſpect ſome ſnare, from the difficulty and heſitation with which in general ſhe paſſes into it; but as ſoon as ſhe enters, the whole herd implicitly follows. Immediately, when they are all paſſed the gateway, fires are lighted round the greateſt part of the encloſure, and particularly at the entries, to prevent the elephants from returning. The

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hunters from without then make a terrible noiſe by ſhouting, beating of *tomtoms* (a kind of drum), firing blunt cartridges, &c. to urge the herd on to the next encloſure. The elephants, finding themſelves enſnared, ſcream and make a noiſe; but, ſeeing no opening except the entrance to the next encloſure, and which they at firſt generally avoid, they return to the place through which they lately paſſed, thinking perhaps to eſcape, but now find it ſtrongly barricaded; and, as there is no ditch at this place, the hunters, to prevent their coming near and forcing their way, keep a line of fire conſtantly burning all along where the ditch is interrupted, and ſupply it with fuel from the top of the paliſade, and the people from without making a noiſe, ſhouting and hallooing to drive them away. Wherever they turn, they find themſelves oppoſed by burning fires or bundles of reeds, and dried graſs, which are thruſt through the opening of the paliſades, except towards the entrance of the ſecond encloſure or *Doobrazecote*. After traverſing the *Baigcote* for ſome time, and finding no chance of eſcaping but through the gateway into the next encloſure, the leader enters, and the reſt follow: the gate is inſtantly ſhut by people who are ſtationed on a ſmall ſcaffold immediately above it, and ſtrongly barricaded, fires are lighted, and the ſame diſcordant din made and continued, till the herd has paſſed through another gateway into the laſt encloſure, or *Rajecote*, the gate of which is ſecured in the ſame manner as the former was. The elephants, being now completely ſurrounded on all ſides, and perceiving no outlet through which they can eſcape, appear deſperate, and in their fury advance frequently to the ditch, in order to break down the paliſade, inflating their trunks, ſcreaming louder and ſhriller than any trumpet, ſometimes grumbling like the hollow murmur of diſtant thunder, but, wherever they make an attack, they are oppoſed by lighted fires, and by the noiſe and triumphant ſhouts of the hunters. As they muſt remain ſome time in this encloſure, care is always taken to have part of the ditch filled with water, which is ſupplied by a ſmall ſtream, either natural or conducted through an artificial channel from ſome neighbouring reſervoir. The elephants have recourſe to this water to quench their thirſt and cool themſelves after their fatigues, by ſucking the water into their trunks, and then ſquirting it over every part of their bodies. While they remain in this encloſure, they continue ſulky, and ſeem to meditate their eſcape, but the hunters build huts and form an encampment, as it were, around them, cloſe to the paliſade; watchmen are placed, and every precaution uſed, to prevent their breaking through. This they would ſoon effect, if left to themſelves, notwithſtanding the paliſade is made of very ſtrong ſtakes ſunk into the earth on the outſide

ſide of the ditch, and ſtrengthened by croſs bars and buttreſſes as already mentioned.

When the herd has continued a few days in the *Keddah*, the door of the *Roomee* is opened, into which ſome one of the elephants is enticed to enter, by having food thrown firſt before, and then gradually further on into the paſſage, till the elephant has advanced far enough to admit of the gates being ſhut. Above this wicker gate, or door, two men are ſtationed on a ſmall ſcaffold, who throw down the food. When the elephant has paſſed beyond the door, they give the ſignal to a man who from without, ſhuts it by pulling a ſtring, and they ſecure it by throwing two bars that ſtood perpendicular on each ſide, the one acroſs the other thus ×, forming the figure of St. ANDREW's Croſs, and then two ſimilar bars are thrown acroſs each other behind the door next to the *Keddah*, ſo that the door is in the centre: for farther ſecurity, horizontal bars are puſhed acroſs the *Roomee*, through the openings of the paliſades, both before and behind thoſe croſſes, to prevent the poſſibility of the doors being broken. The *Roomee* is ſo narrow, that a large elephant cannot turn in it, but, as ſoon as he hears the noiſe that is made in ſhutting the gate, he retreats backwards, and endeavours to force it; being now ſecured in the manner already noticed, his efforts are unavailing: finding his retreat thus cut off, he advances and exerts his utmoſt force to break down the bars, which were previouſly put acroſs a little farther on in the outlet, by running againſt them, ſcreaming and roaring, and battering them, like a ram, by repeated blows of his head, retreating and advancing with the utmoſt fury. In his rage, he riſes and leaps upon the bars with his fore-feet, and ſtrives to break them down with his huge weight. In *February*, 1788, a large female elephant dropt down dead in the *Roomee*, from the violent exertions ſhe made. When the elephant is ſomewhat fatigued by theſe exertions, ſtrong ropes *, with running nooſes, are placed in the outlet by the hunters; and as ſoon as he puts a foot within the nooſe, it is immediately drawn tight and faſtened to the paliſades. When all his feet have been made pretty faſt, two men place themſelves behind ſome bars, that run acroſs the *Roomee*, to prevent his kicking them, and with great caution tie his hind-legs together, by paſſing a cord alternately from the one to the other, like the figure 8, and then faſtening theſe turns as above deſcribed. After this, the *Phara*, *Dools*, &c. are put on in ſucceſſion, in the ſame manner as on the *Goondah*, only that here the people are in greater ſecurity. While theſe ropes are

* Theſe are of the ſame form and ſize nearly as the *Phands*, but much ſhorter in proportion.

making

making faſt, the other hunters are careful not to go too near, but keep on the outſide of the paliſade, and divert his attention as much as they can, from thoſe employed in faſtening them, by ſupplying him with graſs, and ſometimes with plantain leaves and ſugar canes, of which he is remarkably fond, by preſenting a ſtick, giving him hopes of catching it, or by gently ſtriking or tickling his proboſcis. He frequently, however, ſeizes the ropes with his trunk, and endeavours to break them, particularly thoſe with which his feet are tied, and ſometimes tries to bite them through with his grinders (as he has no inciſors or front teeth), but the hunters then goad him with ſharpened bamboos, or light ſpears, ſo as to make him quit his hold. Thoſe who are employed in putting the ropes around his body, and over his head, ſtand above him, on a ſmall kind of platform, conſiſting of a few bars run acroſs through the openings of the paliſades, and, as an elephant cannot ſee any thing that is above, and rather behind his head, they are very little incommoded by him, although he appears to ſmell them, and endeavours to catch them with his trunk. When the whole apparatus is properly ſecured, the ends of the two cables *(Dools)* which were faſtened round his neck, are brought forward to the end of the *Roomee*, where two female elephants are waiting; and to them theſe cables are made faſt. When every thing is ready, the door, at the end of the outlet, is opened, the croſs bars are removed, and the paſſage left clear. The ropes, that tied his legs to the paliſades, are looſened, and, if he does not advance readily, they goad him with long poles ſharpened at the ends or pointed with iron, and urge him on with their noiſe and din, and, at the ſame time, the females pull him gently forward: as ſoon as he has cleared the *Roomee*, his conductors ſeparate, ſo that if he attempts to go to one ſide, he is prevented by the elephant, that pulls in the oppoſite direction, and *vice verſa*. The *Bundahs*, which tie his hind legs, though but looſely, yet prevent his going faſt; and, thus ſituated, he is conducted like an enraged bull, that has a cord faſtened to his horns on each ſide, ſo that he cannot turn either to the right or left to avenge himſelf. In like manner is this noble animal led to the next tree, as the *Goondahs*, before mentioned, were. Sometimes he becomes obſtinate, and will not advance; in which caſe, while one of his conductors draws him forward, the other comes behind and puſhes him on: ſhould he lie down, ſhe puts her ſnout under and raiſes him up, ſupporting him on her knee, and with her head puſhing him forward with all her ſtrength, the hunters likewiſe aſſiſt by goading him, and urging him forward by their noiſe and din: ſometimes they are even obliged to put lighted torches near, in order to make him advance. In conducting ſmall elephants

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from the *Roomee*, only one cable and one *Koomkee* are made uſe of. As ſoon as each elephant is ſecured, he is left in charge to the *Mahote*, or keeper, who is appointed to attend and inſtruct him; and, under him, there are from two to five *Coolies*, according to the ſize of the elephant, in order to aſſiſt and to ſupply food and water, till he becomes ſo tractable as to bring the former himſelf. Theſe people erect a ſmall hut immediately before him, where the *Mahote*, or one of the *Coolies*, conſtantly attends, ſupplies him with food, and ſoothes and careſſes him by a variety of little arts. Sometimes the *Mahote* threatens and even goads him with a long ſtick pointed with iron, but more generally coaxes and flatters him, ſcratching his head and trunk with a long bamboo, ſplit at one end into many pieces, and driving away the flies from any ſores occaſioned by the hurts and bruiſes he got by his efforts to eſcape from the *Roomee*. This animal's ſkin is ſoft, conſidering his great ſize, and is extremely ſenſible, is eaſily cut or pierced, more ſo than the ſkin of moſt large quadrupeds. The *Mahote* likewiſe keeps him cool, by ſquirting water all over him, and ſtanding without the reach of his trunk; in a few days, he advances cautiouſly to his ſide, and ſtrokes and pats him with his hand, ſpeaking to him all the while in a ſoothing tone of voice, and, in a little time, he begins to know his keeper and obey his commands. By degrees, the *Mahote* becomes familiar to him, and at length gets upon his back from one of the tame elephants, and, as the animal becomes more tractable, he advances gradually forward, towards his head, till at laſt he is permitted to ſeat himſelf on his neck, from which place he afterwards regulates and directs all his motions. While they are training in this manner, the tame elephants lead out the others in turn, for the ſake of exerciſe, and likewiſe to eaſe their legs from the cords with which they are tied, and which are apt to gall them moſt terribly, unleſs they are regularly ſlacked and ſhifted. In five or ſix weeks the elephant becomes obedient to his keeper, his fetters are taken off by degrees, and generally, in about five or ſix months, he ſuffers himſelf to be conducted by the *Mahote* from one place to another: care, however, is always taken not to let him approach his former haunts, leſt a recollection of the freedom he there enjoyed ſhould induce him again to recover his liberty. This obedience to his conducter ſeems to proceed partly from a ſenſe of generoſity, as it is, in ſome meaſure, voluntary; for, whenever an elephant takes fright, or is determined to run away, all the exertions of the *Mahote* cannot prevent him, even by beating or digging the pointed iron hook into his head, with which he directs him; on ſuch an occaſion the animal totally diſregards theſe feeble

efforts, otherwiſe he could ſhake or pull him off with his trunk, and daſh him in pieces. Accidents of this kind happen almoſt every year, eſpecially to thoſe *Mahotes* who attend the large *Goondahs*, but ſuch accidents are in general owing entirely to their own careleſſneſs and neglect. It is neceſſary to treat the males with much greater ſeverity than the females, to keep them in awe; but it is too common a practice among the *Mahotes*, either to be negligent in uſing proper meaſures to render their elephants docile, or to truſt too much to their good nature, before they are thoroughly acquainted with their diſpoſitions. The iron-hook, with which they direct them, is pretty heavy, about ſixteen inches long, with a ſtraight ſpike advancing a little beyond the curve of the hook, ſo that altogether it is exactly like that which ferrymen or boatmen uſe faſtened to a long pole.

In this account of the proceſs for catching and taming elephants, I have uſed the maſculine gender, to avoid circumlocution, as both males and females are treated in the ſame manner: the former are ſeldom ſo docile, but, like the males of other animals, are fiercer, ſtronger, and more untractable than the females.

Before I conclude, it may be proper to obſerve, that young elephants ſuck conſtantly with their mouths, and never with their trunks, as BUFFON has aſſerted: a concluſion he made merely from conjecture, and the great and various uſes to which they are well adapted and applied, by every elephant.

I have ſeen young ones, from one day to three years old, ſucking their dams, but never ſaw them uſe their trunks, except to preſs the breaſt, which, by natural inſtinct, they ſeemed to know would make the milk flow more readily. The mode of connection between the male and female is now aſcertained beyond the poſſibility of a doubt; as Mr. BULLER, Lieu. HAWKINS, and many others, ſaw a male copulate with a female, after they were ſecured in the *Keddah*, in a manner exactly ſimilar to the conjunction of the horſe with a mare.

This fact entirely overturns what has been ſo often related, concerning the ſuppoſed delicacy of this uſeful animal, and a variety of other hypotheſes, which are equally void of foundation. As far as I know, the exact time an elephant goes with young, has not yet been aſcertained, but which cannot be leſs than two years, as one of the elephants brought forth a young one twenty-one months and three days after ſhe was taken. She was obſerved to be with young in *April* or *May*, 1788, and ſhe was only taken in *January* preceding; ſo that it is very likely ſhe muſt have had connection with the male ſome months before ſhe was ſecured, otherwiſe they could not diſcover that ſhe was with young, as a fœtus of leſs than

ſix

ſix months cannot well be ſuppoſed to make any alteration in the ſize or ſhape of ſo large an animal. The young one, a male, was produced *October* 16th, 1789, and appeared in every reſpect to have arrived at its full time. Mr. HARRIS, to whom it belongs, examined its mouth a few days after it was brought forth, and found that one of its grinders on each ſide had partly cut the gum. It is now alive and well, and begins to chew a little graſs.

I have further to remark, that one of the tuſks of the young elephant has made its appearance, ſo that we can now aſcertain it to be of that ſpecies called *Mucknah*, the tuſks of which are always ſmall, and point nearly ſtraight downwards. He was thirty-five inches high, at his birth, and is now thirty-nine, ſo that he has grown four inches in nearly as many months. Elephants are always meaſured at the ſhoulder; for the arch or curve of the back, of young ones particularly, is conſiderably higher than any other part, and it is a ſure ſign of old age, whenever this curve is found flattened or conſiderably depreſſed, after an elephant has once attained his full growth.

Though theſe remarks, as well as ſeveral others in the above relation, do not come within the plan I propoſed, which was merely to deſcribe the method of taking wild elephants in the province of *Tipura*, yet I hope they will not be deemed impertinent or ſuperfluous, eſpecially as ſeveral of them tend to eſtabliſh ſome important facts in the natural hiſtory of this animal, that are not known or not attended to, at leaſt in any accounts that I had an opportunity of ſeeing.

EXPLANATION *of ſeveral words uſed by the natives who catch elephants.*

Bundah—a middle-ſized cord, ſix or eight cubits long, which is put round either the hind or fore legs of elephants, in order to ſecure them. From ten to twenty are employed.

Chilkâh—is a very ſlight ſoft cord, which the hunters at firſt put around the hind-legs of a *Goondah*, before they begin to tie him: this is not uſed for *Keddah* elephants.

Dáugbearee—is generally a continuation of every ſecond *Bundah* that is put on, a few turns of which are paſſed round, where the folds of the *Bundahs* interſect each other, in order to faſten and keep them firm. When the *Bundah* is not long enough, another cord is made uſe of.

Dooblah—is that rope which is made faſt on one ſide to the aftermoſt *Pharah*,

then

then carried under the tail and faſtened to both the *Pharahs* on the oppoſite ſide, ſo as to anſwer the purpoſe of a crupper, and to keep the *Pharahs* in their places.

Dool—is a large cable, about ſixty cubits long, with a running nooſe. Two of them are put round the neck of the elephant, and faſtened to the foremoſt *Phara* or girth, one on each ſide, in ſuch a manner, as to prevent the nooſes from being drawn too tight or coming too far forward, and this is effectually done by the *Dooblah*; for whenever the elephant draws back, the *Dools* pull the crupper forward, which muſt gall him very much, and prevent him from uſing all the force he might otherwiſe exert in order to free himſelf.

Phand—is a cable nearly the ſame ſize as the *Dool*, the nooſe of which is put round each leg of the *Goondahs*, and then it is tied to trees or ſtakes. The *Phands*, uſed for the *Keddah* elephants, are only about thirty cubits long.

Phárah—a rope that is put round the body of an elephant, like a girth, and to which the *Dooblah* and *Dools are connected.*

Tooman—is the rope that is paſſed round the buttocks of an elephant, and prevents his ſtepping out freely: it is faſtened to the girth and crupper, that it may not ſlip down.

Tipura, March* 29th, 1790.

THE PLAN OF A COMMONPLACE-BOOK.

By J. HARINGTON, *Eſq.*

MR. *Locke* eſteemed his method of a commonplace-book "ſo mean a thing, as "not to deſerve publiſhing in an age full of uſeful inventions," but was induced to make it publick at the requeſt of a friend. This perhaps ſhould have deterred me from offering a paper of the ſame denomination, to a ſociety inſtituted for enquiring into the more eſſential parts of literature; yet, ſince Mr. *Locke* bears teſtimony to the utility of his method, after five-and-twenty years' experience, and ſince whatever may tend to aſſiſt the acquiſition of knowledge, cannot, I conceive, be deemed

* The ancient name of the province was *Tripura*, or *with three towns*, which has been corrupted into *Tipra* or *Tipara*.

undeſerving

undeſerving of attention, I venture to ſubmit the plan of a commonplace-book, which has occurred to me, founded on Mr. *Locke*'s, but calculated, I think, to obviate an inconvenience to which his is ſubject.

On conſidering the method deſcribed and recommended by Mr. *Locke*, it appeared to me that the number of words, having the ſame initial letters and following vowels, might frequently make it tedious to find a particular head, if noted in the index by a numerical reference to the page only; and that the ſame cauſe might render it difficult to aſcertain whether any particular head had been entered. For inſtance, *balm*, *bark*, *bard*, *bat*, *baron*, having, with numerous other words, the ſame initial letter and ſucceeding vowel, ſeveral references to the pages pointed out by Mr. *Locke*'s numerical index might be neceſſary, before any one of them, in particular, could be found; or before it could be aſcertained, whether any one of them had been previouſly entered in the book. An index, of which the following is a ſpecimen, would, it is preſumed, remedy theſe apparent diſadvantages. How far it is free from others, will be known from experience.

A ſhort explanation of the method adopted for this book will be ſufficient. One-and-twenty pages, divided each into five columns, and ſubdivided in the ſeveral columns for the number of the folios, the letters of the alphabet written at the head of each page, and the five vowels inſerted in the columns under each letter, will form a ſufficient index, provided the letters J, Q, V, X, and Z, inſtead of having diſtinct pages appropriated to them, be written in the ſame pages with I, P, U, W, and Y, which they may be without inconvenience.

The *Index*, thus prepared, is ready to receive the heads of whatever ſubjects may be entered in the book under their correſponding initial letters and following vowels, or under their initial letters and ſimilar vowels, when the head is a monoſyllable and begins with a vowel. It is hardly neceſſary to repeat Mr. *Locke*'s remark, that "every head ought to be ſome important and eſſential word or term." If a ſmall margin be left in each folio of the book, and the indicative word or head be written on it, it will be conſpicuous, although ſeveral heads ſhould be included in the ſame folio; but, until it become neceſſary, from there being no remaining folios wholly blank, it is adviſeable to appropriate a ſeparate folio to each head, as, by this means, the ſeveral ſubjects entered are kept more diſtinct, and any additions may be made to the ſame head, without the trouble of reference to other folios; for which purpoſes it is alſo advantageous to place the folio-numbers on the left pages only, leaving the right-hand pages for a continuation of the ſubjects entered on the left, or for remarks

marks thereon, until it become neceſſary to appropriate them to new heads, in order to fill the book.

To theſe remarks, which may appear more than adequate to the occaſion, it will be ſufficient to add, that, if the heads in the index ſwell, under any letter, beyond the dimenſions of the ſingle page aſſigned to them (which however in a book of moderate ſize is not probable) they may be continued on a ſecond page, to be prepared for the ſame letter, at the end of the original index, for which purpoſe ten or twelve blank leaves may be left between the index and the commencement of the book: and laſtly, that if the entries in the book, under any head, fill more than the two pages firſt appropriated to it, the ſame head may be continued in any ſubſequent blank folio, by obvious notes of reference, at the foot of the former and top of the latter, without any new entry in the index, which would then be unneceſſarily filled.

The *Aſiatick* Society was inſtituted for enquiring into the antiquities, arts, ſciences, and literature of *Aſia*; and the humble plan of a commonplace-book cannot claim admiſſion among any one of theſe objects: it may however be conſidered as connected with all, ſince it may aſſiſt enquiries concerning the whole of them. If it be aſked, whether ſuch a plan be within the local limits of this ſociety, it may be anſwered, that it is, in its nature, univerſal; but if any particular plan be deſigned in *Aſia*, ſuch plan may, with propriety, be tendered to the *Aſiatick* Society, for the benefit either of publication in their Tranſactions, if deemed worthy of it, or of ſuppreſſion, for the author's ſake, if deemed uſeleſs. A ſimilar index with thirty pages and ten columns, according to the number of the *Nagari*-conſonants and vowels, which are moſtly in uſe, would ſuit a commonplace-book intended to compriſe the whole extent of *Aſiatick* literature.

Each of the figures A, B, C, muſt be conſidered as repreſenting a large folio page; and it ſeemed unneceſſary to exhibit the ſpecimen, on a more extenſive ſcale: the numbers of the *folios* are ſuppoſed to be thoſe of the commonplace-book. The names *Arabia*, *Bahmen*, *Campilla*, and the reſt, are given by way of example, but were not ſet down with any particular ſelection.

A.

a	*fol.*	e	*fol.*	i	*fol.*	o	*fol.*	u	*fol.*
Arabia.	256	*Ahremen.*	256	*Ahilya.*	255	*Aſoca.*	254	*Aguru.*	256

B.

a	*fol.*	e	*fol.*	i	*fol.*	o	*fol.*	u	*fol.*
Bahmen.	255	*Beli.*	255	*Bilva.*	256	*Borax.*	255	*Bhuchampac.*	254

C.

a	*fol.*	e	*fol.*	i	*fol.*	o	*fol.*	u	*fol.*
Campilla.	255	*Ceſari.*	255	*Criſhna.*	254	*Chorapuſhpi.*	255	*Cuſha.*	255

Aſoca: This is the true name of a charming tree, inaccurately named *Aſjogam* in the *Hort. Malab.* vol. 5. tab. 59. It is a plant of the *eighth* claſs and *firſt* order, bearing flowers of exquiſite beauty; and its fruit, which *Van Rheede* had not ſeen, is a *legume*, compreſſed, incurved, long pointed, with ſix, ſeven, or eight ſeeds: it will be deſcribed very fully in a paper intended for the Society. The *Brahmens*, who adore beautiful objects, have conſecrated the lovely *Aſoca:* they plant it near the temples of *Siva*, and frequently mention a grove of it, in which *Ravan* confined the unfortunate *Sita*. The *eighth* day from the new moon of *Chaitra* incluſive, is called *Aſocaſhtami*.

Criſhna: Properly *black* or *dark blue*, an epithet of the *Hindu* God, whoſe youthful

ful exploits reſemble thoſe of *Apollo Nomius:* he was particularly worſhipped by the *Suraſena*, or people of *Matthura:* and *Arrian* ſays, that the *Suraſeni* adored *Hercules*; but the deity whom he means, was *Hercules Muſagetes*, or *Gopinat'ha*, who was the patron of ſcience, according to Mr. *Bryant*, or the 'God of Eloquence, with the Muſes in his train.' See *Anal. Anc. Mythol.* vol. 2. p. 74. The *Gopyah* were the patroneſſes of muſick and poetry.

Bhuchampac: So the *Hindus* call a beautiful plant deſcribed by *Rheede*, and admitted by *Linnæus*, under the names of *Kæmpferia rotunda*. The *Indian* appellation is very improper, as the flower has no reſemblance to the *Champac*, except in the richneſs of its odour. *Bhu* means *ground*, from which the bloſſoms riſe with a ſhort ſcape, and ſcarce live a whole day.

Ceſari: A lion in *Sanſcrit*, ſo named from his mane: *Ceſa* and *Ceſara* ſignify *hair*. Etymologiſts will decide whether *Cæſaries* and *Cæſar* had an affinity with thoſe *Indian* words.

Ahilya: The celebrated conſort of an old *Indian* ſage, named *Gotama:* hence it is the name of a rich *Mahratta* lady, who employs her wealth in works of devotion at *Benares* and *Gaya*, as well as in her own country.

Borax: A corruption of the *Arabick* word *burak*, or *brilliant*. It is found in its native ſtate, both in *Tibet*, according to *Giorgi*, and in *Nepal*, according to Father *Giuſeppe*.

Cuſha: Pronounced more correctly *Cuſa*, with a palatial *ſ*; a graſs held ſacred by the *Brahmens*, from time immemorial. It is the *Poa Cynoſuroides* of Dr. *Koenig*.

Beli: The *Belus*, probably of the *Greeks*; for though *bal* ſignifies lord, in moſt eaſtern dialects, yet in *Chaldaic*, according to *Selden*, it was written *Bel*, exactly as the name of the *Hindu* monarch is vulgarly pronounced.

Chorapuſhpi: Or *Thief-flowered*; the corymbed *Scirpus* with awled ſpikes, ſo troubleſome in our *Indian* walks.

Campilla: Commonly called *Camala-guri*, a plant uſed by dyers, of a new genus; deſcribed by Dr. *Roxburgh*.

Bahmen: An old *Perſian* month and the genius preſiding over it: the name alſo of a celebrated king and hero.

Bilva: The *Cratæva Marmelos*, but certainly miſplaced in *Linnæus*; its fruit has lately been found very beneficial in diarrhœas.

Ahremen:

Ahremen: So *Hafiz* writes the vowels in this name of the *evil genius*; but, in ſome *Arabian* books, it is written *Ahermen*.

Arabia: In this celebrated peninſula, the richeſt and moſt beautiful of languages was brought to perfection: the *Arabick* dictionary by *Golius* is the moſt elegant, the moſt convenient, and, in one word, the *beſt* that was ever compiled in any language.

Aguru: The true name of the fragrant aloe-wood: the tree grows in *Silhet*, but has not bloſſomed in gardens near *Calcutta*.

END OF VOLUME I.

[*T. Davifon, Lombard-ſtreet, White-friars.*]

Directions to the Binder.

Cancel pages 493 and 494, where the Volumes divide.

There being no Signatures or Folios to three Sheets of Tables, the following Words must fold so as to indicate the signature Page of each Sheet:

1 line,	*February* 1786	To be placed in this Order between Sig. *B b* and *G g*.
— to	*(C c)*, &c.	
Ditto	*(O)*, &c.	

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